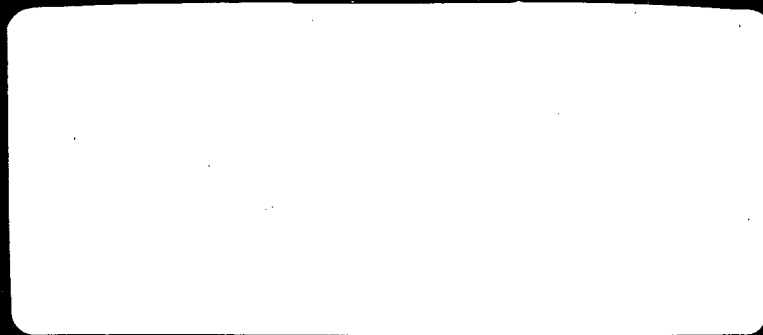


SDMS Document



118656



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Associates**

101954

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216 PATERSON PLANK ROAD SITE  
CARLSTADT, NEW JERSEY  
  
FIRST OPERABLE UNIT  
TREATABILITY TESTING WORK PLAN

Prepared for:

The 216 Paterson Plank Road Cooperating PRP Group

Prepared by:

Golder Associates Inc.  
305 Fellowship Road  
Mt. Laurel, New Jersey

**DISTRIBUTION:**

4 Copies - U.S. Environmental Protection Agency  
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1 Copy - Cooperating PRP Group Technical Committee Members  
2 Copies - Golder Associates Inc.

August 1998

Project No.: 943-6222

**101955**

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August 11, 1998

Project No.: 943-6222

Chief, New Jersey Compliance Branch  
Emergency and Remedial Response Division  
U.S. Environmental Protection Agency, Region II  
290 Broadway  
New York, NY 10278

Attn: Mr. Jon Gorin, Remedial Project Manager

RE: 216 PATERSON PLANK ROAD SITE, CARLSTADT, NEW JERSEY  
FIRST OPERABLE UNIT TREATABILITY TESTING WORK PLAN

Gentlemen:

On behalf of the 216 Paterson Plank Road Cooperating PRP Group (Group), we enclose four copies of the above Treatability Testing Work Plan, which has been prepared pursuant to the Focused Feasibility Study Investigation Report submitted to USEPA on November 21, 1997 and subsequent discussions. Three copies have also been provided to the New Jersey Department of Environmental Protection under separate cover.

The Work Plan includes consideration of several in-situ remediation technologies that may be applicable to the sludge "hot spot" previously identified at the site. In order to complete the treatability studies, it will be necessary to collect samples of the sludge just prior to undertaking the laboratory work. As you are aware, the Group is about to commence the final phase of Off-Property Investigation at the site and, if possible, we would like to collect the treatability testing samples during this field program. We would therefore appreciate your early review and approval of this Work Plan so that the sampling can be undertaken by the end of September.

If any questions arise during your review of the enclosed Work Plan, please do not hesitate to contact me.

Very truly yours,

GOLDER ASSOCIATES INC.

P. Stephen Finn, C.Eng.  
Facility Coordinator

g:\projects\943-6222\Treatabi\CVRLTR.doc

cc: Chief, Bureau of Federal Case Management  
Division of Hazardous Waste Management  
N.J. Department of Environmental Protection  
Attn: Mr. Robert Hayton, Case Manager

216 Paterson Plank Road Cooperating PRP Group Technical Committee  
William L. Warren, Esq., Drinker Biddle & Reath

101956

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Cover Letter

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## **1.0 PURPOSE AND BACKGROUND**

### **1.1 Purpose**

This Treatability Testing Work Plan has been prepared for evaluation of in-situ treatment/stabilization technologies that might be used for remediation of a sludge "hot spot" within the First Operable Unit (FOU) at the 216 Paterson Plank Road Site (the Site) in Carlstadt, NJ. The work is being conducted pursuant to the additional work provisions of an Administrative Order on Consent (AOC, Index No. CERCLA II-50114) dated September 30, 1985, the requirements of the Focused Feasibility Study (FFS) Work Plan (Golder Associates, 1995) and the recommendations included in the associated Investigation Report (Golder Associates, 1997b). The FFS Work Plan was approved by the U.S. Environmental Protection Agency (USEPA) on June 23, 1997 and is being implemented to provide a basis for selection of a final remedy for the FOU. This Work Plan documents background information, describes the in-situ treatment/stabilization technologies to be evaluated, and the treatability performance objectives and testing protocol, together with health and safety/waste management considerations, schedule and deliverables.

### **1.2 Background**

The six-acre Site is a former chemical recycling and waste processing facility that ceased operation in 1980 and was placed on the USEPA National Priority List in 1983. A Remedial Investigation (RI) was initiated in 1987 leading to a USEPA Record of Decision (ROD) in 1990. Interim Remedial Measures (IRM), pursuant to the ROD, have been in place at the Site since 1992 and include a composite HDPE slurry wall containment system which encompasses the FOU, as well as a geosynthetic cover.

Phase I of the FFS was completed and presented to USEPA at a meeting on January 25, 1996 along with recommended remedial alternatives for detailed evaluation in Phase II of the FFS. Phase I of the FFS identified a number of severe limitations and complex issues associated with site-wide ex-situ remedial options, including difficulties associated with the large amount of massive construction and demolition (C&D) debris contained within the FOU fill, health and safety considerations associated with emission of volatile organic compounds (VOCs) from the excavated material, and stability concerns with respect to the slurry wall containment system during any excavation of FOU fill materials. These limitations were discussed in detail in the FFS Investigation Work Plan (Golder Associates, 1997a), which concluded that site-wide ex-situ

treatment alternatives should be eliminated from further consideration in the FFS. Instead, it was recommended that in-situ treatment alternatives be evaluated with particular reference to the potential "hot spot" area. The following working definition of a "hot-spot" was also established:

- an area where, if chemical constituents were removed and/or treated, the Site-wide risk would be reduced by over an order of magnitude; and
- an area small enough to be considered separately from remediation of the entire FOU.

Based on previous investigations, Phase I of the FFS identified that "sludge" in the vicinity of RI boring B-1 potentially fits this working definition of a "hot spot." The sludge was described as a fine-grained material with a grease-like consistency that offered little resistance to penetration during drilling, and was relatively free of debris (unlike the rest of the FOU fill which contains a significant amount of debris). The highest concentrations of polychlorinated biphenyls (PCBs) on the site and elevated VOC concentrations were also associated with this material. As a result, remediation of the sludge constituents detected in boring B-1 would yield almost a two order of magnitude reduction in direct contact risk.

In order to complete the evaluation of remedial alternatives retained from Phase I of the FFS it was determined that certain data gaps must be filled resulting in the submission of an FFS Investigation Work Plan (Golder Associates, 1997a). The investigation performed pursuant to that work plan gathered data on the nature and extent of the potential sludge "hot spot" area using geophysical survey techniques, soil borings, and sample analyses; verified the geotechnical properties of the soils directly underlying the FOU fill; and evaluated the need for additional treatability/pilot test work. The results of the investigation are reported in Golder Associates (1997b) and confirmed the presence of a discrete area of sludge that is relatively free of the debris present in most of the FOU fill and may be considered as a "hot spot." The geotechnical data collected during the investigation were used in excavation stability analyses that indicated an excavation side slope of 4.5H:1V would only be marginally stable under existing conditions. As discussed in detail in the FFS Investigation Work Plan (Golder Associates, 1997a), the implementation difficulties and risks associated with excavation and handling of the sludge "hot spot" materials are such that in-situ remedial alternatives warrant serious consideration in the FFS. In order to explore the feasibility of in-situ treatment options, additional treatability study work is necessary.

### 1.3 Sludge "Hot Spot" Properties

The "hot-spot" as defined by its physical properties, is approximately 4,000 square feet in area and consists predominantly of sludge material and fine-grained soil with little debris (see Figure 1-1). Based on an average thickness of ten feet, the total volume of the sludge "hot-spot" is approximately 1,480 cubic yards. The chemical characteristics of the sludge "hot spot" include the highest VOC and PCB concentrations detected anywhere on site.

*Ten feet ??  
to clay layer?*

Samples of the sludge material collected during the sludge "hot spot" investigation (Golder Associates, 1997b) were analyzed for their physical and chemical characteristics. The sludge material is actually a mixture of sludge, fill, and peat materials in discrete zones within the FOU fill. Two types of sludge (based on physical properties) were encountered: a black sludge with a grease-like consistency, and a brown sludge containing fine sand. In addition, varying quantities and sizes of glass, wood, brick, and plastic debris are present in the sludge although the more massive debris characteristic of the remainder of the Site is absent. Particle size analyses indicate the "hot-spot" materials consist of fines (silt and clay), with some fine sand, and trace to some fine gravel.

As part of the "hot-spot" investigation, eight samples (excluding quality control samples) of the sludge were analyzed for Target Compound List (TCL) VOCs, TCL semi-volatile organic compounds (SVOCs), TCL pesticides/PCBs, Target Analyte List (TAL) metals, total organic carbon (TOC), oil and grease (by both gravimetric and inferred absorption methods), pH, and moisture content. The data are summarized in Tables 1-1 through 1-5.

Sixteen VOCs were detected at combined (total VOC) concentrations ranging up to approximately 12,000 parts per million (ppm), although only four VOCs (tetrachloroethene, trichloroethene, vinyl chloride, and 1,2-dichloroethane) were detected at concentrations greater than the Preliminary Remediation Goals (PRGs) established for the site by USEPA (USEPA, 1993). Thirty-four SVOCs were detected at combined concentrations ranging up to approximately 1,300 ppm, nineteen of which were detected in more than one-half of the samples. However, only three SVOCs - benzo(a)pyrene, dibenz(a,h)anthracene, and bis(2-ethylhexyl) phthalate - were detected at concentrations greater than the PRGs for the Site. Three pesticides were detected. Aldrin (1.6 ppm) and dieldrin (0.86 ppm) were detected in only one sample, at concentrations above the PRGs for the site. Endrin ketone was also detected (12 ppm) in one sample, but there is no PRG for endrin ketone at the site. Arochlor-1242 was detected at

concentrations ranging from 49 ppm to 1,400 ppm and exceed the site PRGs in all samples. Aroclor-1242 was detected in a sample from RI boring B-1 at a concentration of 15,000 ppm. It should be noted the SVOCs and pesticides exceeded the PRGs by a much smaller degree than the VOCs and PCBs and do not drive the overall risk at the Site. Total organic carbon ranged from 16,000 ppm to 62,900 ppm (i.e., approximately 1.5 percent to 6.3 percent). Oil and grease concentrations ranged from 3,040 ppm to 106,000 ppm (i.e., 0.3 percent to 10.6 percent).

TAL metals in the sludge that exceed the site PRGs include arsenic, beryllium, and lead. The arsenic and beryllium concentrations (up to 13 ppm and 2.5 ppm, respectively) are similar to background concentrations detected at reference locations in New Jersey (Fields et. al., 1993). Lead concentrations range up to 1,320 ppm. All of these metals exceed the PRGs by a much smaller degree than the VOCs and PCBs and therefore, they are not driving the overall risk.

According to the Baseline Risk Assessment (Clements, 1990) over 98 percent of the direct contact risk is attributable to VOCs and PCBs.

*Problems with cement CAP raising pH + "free" acid.*

#### 1.4 In-Situ Treatment Technologies to be Evaluated

Based upon the above chemical concentration data, treatment of VOCs and PCBs will provide the most effective risk reduction for the sludge "hot spot". Therefore, in-situ treatment technologies to be evaluated should focus on treatment of VOCs and PCBs. A secondary requirement is to provide adequate physical strength to support surface loads during potential future beneficial use of the site. The following in-situ treatment technologies will therefore be evaluated for potential application at the sludge "hot spot":

- Air stripping;
- Solidification/stabilization using portland cement and/or clay; and
- Solidification/stabilization using portland cement and/or clay amended with zero-valent iron.

The in-situ mixing of these solidification/stabilization (S/S) agents is shown schematically on Figure 1-2. A crane or other truck-mounted mechanism is used to drive either augers or paddles that mix the reagent(s) with the soil in-situ. Prior to introducing the S/S agent, ambient air can be circulated through the soil column as it is mixed to remove VOCs. A shroud at the ground surface is connected to a vacuum blower in order to maintain a negative pressure in the shroud

by 1.5 cap  
1500 m.

and capture VOCs for treatment by vapor-phase activated carbon, or other appropriate means prior to venting of the gas to the atmosphere. Mixing times are anticipated to be 0.5 to 1.5 hours for each soil column to 15 feet depth. The above process would be repeated until the entire volume of the sludge "hot spot" has been treated. The treatability studies described herein are designed to determine the effectiveness of each of the three techniques (air stripping, stabilization, and amendment with zero-valent iron).

- 0.5 m/s

2 hours?

40, 60  
7 m/s

Air stripping will be examined as a potential pre-treatment step to remove VOCs prior to S/S. Cement S/S agents are expected to provide some treatment of organic compounds, through thermal decomposition (due to the heat of hydration from the cement) or through bond cleavage, thereby reducing their toxicity, mobility, and volume. However, cement S/S agents will largely be used to treat organic substances through microencapsulation, which will reduce their mobility and availability for incidental ingestion. S/S agents will also incorporate any free liquid that might be present in the sludge into the mineral matrix, reducing its mobility. The cement S/S agents will also treat the inorganic constituents and reduce their mobility through both microencapsulation and incorporation into the cement through chemical bonding. Clay S/S agents would reduce the mobility of both organic and inorganic constituents.

S/S agents amended with zero-valent iron will also be evaluated. The zero-valent iron amendments are designed to produce dechlorination of VOCs and PCBs either during or after initial mixing, thereby reducing the volume and toxicity of these constituents. Zero-valent iron is known to dechlorinate VOCs in-situ when used in permeable reactive groundwater treatment walls or ex-situ as a unit process in groundwater pump and treat systems. The dechlorination reaction mechanism has generally been demonstrated with the chlorinated VOC in aqueous phase contact with the iron metal surface. Therefore, dechlorination may decrease after the cement-based S/S agent cures and hydrates. Dechlorination is expected to occur while water is present (the cement S/S agent is delivered in a water slurry for mixing with the soil) and potentially after solidification as a result of direct contact with the zero-valent iron mixed throughout the waste mass. The clay-based S/S agent will retain water in the interstices of the clay particles. Therefore this formulation should provide sufficient water for the dechlorination reaction to proceed during and after the clay S/S agent is mixed with the soil.

Based on the current state of research in this area, it is not clear to what extent zero-valent iron results in dechlorination of PCBs. Even partial dechlorination would provide a reduction in toxicity because the less chlorinated PCB congeners are generally less toxic.

For general scoping purposes, the amount of S/S agent required is approximately 25 percent of the material being stabilized (by weight), or about 400,000 pounds. The associated volume increase may, therefore, add one to two feet to the thickness of the sludge "hot spot." Based upon the constituent concentrations presented in Tables 1-1 through 1-5, and a stoichiometric factor of five for zero-valent iron mass relative to that of the chlorinated organic compounds present, approximately 225,000 pounds of zero-valent iron may be required to treat the "hot-spot."

---

## 2.0 TREATMENT OBJECTIVES AND PERFORMANCE GOALS

The overall goal of the sludge "hot spot" treatment is to achieve at least an order of magnitude reduction in long-term site-wide risk. This risk reduction would be accomplished through one or more of the following treatment steps.

- Air stripping as an initial treatment step to remove VOCs and thereby reduce their mobility and volume in the "hot spot" prior to mixing with S/S agents.
- In-situ stabilization treatment of VOCs and PCBs to reduce their mobility and availability for direct contact exposures, principally through microencapsulation. Some reduction of constituent volume is also expected.
- Treatment by zero-valent iron to provide additional treatment of chlorinated organics.

Treatment of SVOCs and inorganics will also occur but would result in negligible additional risk reduction. Mitigation of the direct-contact threat which drives the Site-wide risk could be accomplished solely by pathway elimination (e.g., a soil cover along with a site fence and deed restrictions), but S/S will provide added benefits through reduction in toxicity and mobility by rendering the constituents within a solidified mass that effectively precludes direct contact. S/S agents will also reduce potential volume, toxicity, and mobility of constituents to groundwater, thereby reducing risk from the hypothetical future groundwater ingestion pathways.

The specific objectives of this treatability study are to:

- Evaluate the effectiveness of air stripping for reducing VOC concentrations prior to introduction of the various S/S agents;
- Identify formulations using cement- and clay-based S/S agents that will provide the desired bearing strength and physical characteristics;
- Evaluate the reduction in total constituent concentration achieved by the selected S/S agent formulations;
- Evaluate the reduction in constituent mobility provided by the selected S/S agent formulations; and
- Evaluate whether zero-valent iron amendments provide additional reduction in total constituent concentrations.

The scope of work for addressing these performance goals and objectives is described in the next section.



---

### 3.0 SCOPE OF WORK

The treatability testing will be conducted in four phases:

Phase I – Field Sampling and Baseline Characterization;

Phase II – Screening Tests;

Phase III – Intermediate Tests; and

Phase IV – Verification Tests.

The scope and protocol for each of these phases is shown schematically on Figures 3-1a and 3-1b and described in greater detail below. For each phase, the experimental design, procedures, planned samples/analyses, and data analysis are discussed as appropriate.

#### 3.1 Phase I – Field Sampling and Baseline Characterization

Phase I will involve collection of a sufficient volume of representative material from the sludge “hot spot” to support the treatability testing. Sampling will be biased toward the location with the highest VOC and PCB concentrations detected within the sludge “hot spot” in previous site investigations (i.e., sample location GB-7F; see Figure 1-1). The sample will be collected using a split spoon sampler and transferred into either new five-gallon polyethylene buckets or a U.S. Department of Transportation (USDOT) drum in a manner that reduces mixing and potential loss of VOCs. The drill rig, including augers and split spoon samplers, will be steam cleaned before and after use at the site, but decontamination between sampling locations will not be necessary because the discrete samples will ultimately be homogenized to the extent possible upon receipt at the lab. The containers will be secured for shipping and labeled in accordance with USDOT requirements for laboratory treatability testing samples. The samples will be shipped under appropriate chain-of-custody. The existing HDPE cover will be repaired at the sampling location(s) consistent with previous work at the Site.

Upon receipt at the laboratory, a “parent” mixture will be created by homogenizing the material (to the extent practical given the fine-grained, plastic consistency of the material). Homogenization presents the potential for loss of VOCs from the sample, which will be reduced to the extent practical, consistent with the overriding need to achieve representative, repeatable samples of the parent mixture. To limit the potential loss of VOCs, homogenization will be performed after cooling the sample to 4°C. Emission of VOCs during mixing will be monitored

in the air just above the mixing apparatus using an organic vapor analyzer. The parent material will be stored with minimum headspace under cool (4°C), moist conditions.

The parent material will be visually described and analyzed for the following characteristics:

- Total constituent concentrations of TCL VOCs and PCBs;
- pH;
- Moisture content;
- Percent solids;
- Bulk density;
- Specific gravity; and
- Ignitability (flash point).

The concentrations of SVOCs, pesticides, arsenic, beryllium, and lead in previous samples were only slightly above the PRGs for the site. Therefore, the testing is focused upon VOCs and PCBs, as well as physical characteristics, to assess the overall performance of the various treatment technologies. The initial characterization tests will be performed in triplicate to assess the degree of homogenization of the parent material that was achieved, and to assist in the interpretation of subsequent treatability tests. Matrix spike recoveries will be used to assess the degree of matrix interference with the test methods.

The baseline samples will also be extracted using the Synthetic Precipitation Leach Procedure (SPLP; USEPA Method 1312) and the extract will be analyzed for TCL VOCs and PCBs. The SPLP will be used to emulate any precipitation that might pass through the waste mass at the Site, in the absence of a cap, and potentially transport constituents to groundwater.

Additional samples of the parent material will be collected and analyzed for total constituent concentration of TCL VOCs and PCBs at the beginning of each of the various stages of treatability testing described below in order to evaluate potential loss of constituents through time which are unrelated to treatment. SPLP tests are not considered necessary for the parent material testing at these intermediate stages, but will be repeated for the parent material during verification testing (Phase IV).

Samples will be collected in accordance with the requirements listed in Table 6-5. Quality Assurance Plans (QAP) for the treatability laboratory and the analytical laboratory are provided in Appendices A and B.

### **3.2 Phase II – Screening Tests**

Screening tests during Phase II will be used to identify cement and clay formulations that produce the necessary physical characteristics. Samples of the parent material will be mixed with cement and/or clay in various mass ratios and the resulting mixtures will be allowed to cure. Penetrometer strength index tests will be conducted after the mixtures have cured for three days and again after seven days. Selected mixtures will be tested for unconfined compressive strength (UCS) after seven days of curing.

### **3.3 Phase III – Intermediate Tests**

During Intermediate Testing, the benefits of in-situ air stripping of the soils prior to S/S, as well as the potential benefits of zero-valent iron amendments to the formulations selected in Phase II, will be evaluated.

#### **3.3.1 Air Stripping**

For the air stripping test, an aliquot of material will be taken from the parent material for testing. The aliquot will be sampled and submitted for total constituent analysis of TCL VOCs. The remainder of the aliquot will be subjected to a bench-scale simulation of in-situ air stripping during soil mixing in a contained vapor apparatus. The soil sample will be mixed using a Hobart mixer (or equivalent) within a sealed glove box. The flow rate, temperature, and humidity of the influent air will be continuously recorded. Any VOCs evolved during mixing will be carried by the sweep gas out of the glove box to an absorbent cartridge. A sampling tee upstream from the absorbent tube will be used for continuous total VOC concentration monitoring of the sweep gas.

The absorbent tubes will be analyzed for VOCs using a modified version of USEPA Method 8260. Soil VOC samples will also be collected at elapsed times of approximately 10, 30, and 60 minutes after the start of mixing/air stripping and analyzed for total constituent concentrations of TCL VOCs. A fourth sample may be collected if the total VOC concentration in the sweep gas remains elevated after 60 minutes of air stripping. The air and soil sample results will be used to evaluate the performance of air stripping with respect to mass removal of VOCs. The continuous total VOC monitoring of the off-gas will be used in order to evaluate the VOC removal rates and

hence provide a qualitative measure of the required duration of air stripping. The absorbent tube analyses will be used to speciate the total VOC concentration data in order to estimate the mass balance of various VOCs removed over time (in conjunction with total VOC/flow rate monitoring and soil sample analyses) and to evaluate the type and degree of off-gas treatment that would be required for full-scale operation.

### **3.3.2 Zero-Valent Iron Amendment**

Two aliquots of the parent material will be taken for use during this phase of testing. The aliquots will be sampled for analysis of TCL VOCs and PCBs on a total constituent concentration basis, as well as in SPLP extracts. The remaining portion of the aliquots will be treated using the S/S formulations selected during Phase II with and without the addition of zero-valent iron. The zero-valent iron will be added to the S/S formulations in amounts corresponding to five times the stoichiometric amount required for dechlorination of all chlorinated TCL VOCs and PCBs in the sample.

The tests will be conducted as bench-scale mold tests and will be allowed to cure for 21 days, after which they will be analyzed for unconfined compressive strength as well as the concentrations of TCL VOCs and PCBs on a total constituent concentration basis and in the SPLP extract. The results will be interpreted to determine whether zero-valent iron amendments result in significant reduction of TCL VOC and/or PCB total constituent concentrations. Reductions will be evaluated based on both the total constituent concentrations, and on the SPLP extract concentrations. The evaluation will compare concentrations of TCL VOCs and PCBs in the various test mixtures relative to the results for the parent mixture after normalizing the data for dilution by the S/S agent. If the zero-valent iron amendment provides a significant reduction in toxicity, mobility, or volume of TCL VOCs and/or PCBs, it will be retained for verification testing in Phase IV.

### **3.4 Phase IV – Verification Tests**

Upon completion of the Phase III Testing, one or more treatment approaches will be selected for final verification testing. The treatment method(s) may include air stripping as a pre-treatment step, to be followed by a S/S agent, possibly amended with zero-valent iron. The selected treatment approach(es) will be tested together along with a control sample that is carried through the apparatus without treatment to evaluate the overall level of treatment that will be provided. For each treatment approach verification test (and the control sample), an aliquot of the parent

material will be collected and sampled. The samples will be submitted for analysis of TCL VOCs and PCBs and TAL metals on a total constituent concentration basis as well as in SPLP extract without any treatment. The remaining portion of the aliquot will be subjected to the selected treatment approach and allowed to cure for 28 days. The treated sample(s) will be visually described and tested for the following characteristics:

- Total constituent concentration of TCL VOCs and PCBs;
- Total constituent concentration of TAL metals;
- Concentration of TCL VOCs and PCBs, as well as TAL metals, in SPLP extract;
- Moisture content;
- Percent solids;
- Bulk density;
- Ignitability (flash point);
- Volume increase;
- Unconfined compressive strength; and
- One-dimensional consolidation.

The results will be interpreted to evaluate the overall level of treatment that can be achieved, and to specify a method-based treatment specification for full-scale application in the field. This approach is expected to achieve comparable performance to a concentration-based treatment standard but will be much easier to implement in the field.

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#### 4.0 HEALTH AND SAFETY

The Health and Safety Plan developed for the previous hot-spot investigation activities (Golder Associates, 1997a) will be used for field sample collection. The treatability and analytical laboratories will use the health and safety protocol for their facilities together with knowledge of the nature of the samples and the likely constituents present as presented herein.

---

## 5.0 WASTE MANAGEMENT

The only investigation-derived waste that is expected to be generated in the field is used personal protective equipment, steam cleaner condensate, and fill materials washed from equipment. Steam-cleaner condensate will be contained on a temporary decon pad, pumped into 55-gallon drums, and transferred to the aboveground storage tank after filtering to remove visible sediment. Used PPE and solids washed from sampling equipment will be contained in separate USDOT 55-gallon drums for off-site disposal in accordance with applicable regulations.

The treatability and analytical laboratories will follow their facility-specific plans for management of laboratory wastes. Any remaining parent material will be returned to the site and stored in the container in which it was originally shipped to the treatability laboratory.

---

**6.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS**

Samples of the sludge "hot spot" will be collected from the site in accordance with the procedures presented in Section 3.1 above. No field QA/QC samples, such as field rinsate blanks or field duplicates, are considered to be necessary.

The treatability testing is anticipated to be performed by Kiber Environmental Services, Inc. of Atlanta, Georgia. The treatability testing components of this work plan are covered by Kiber's treatability laboratory QA/QC program which is included in Appendix A. Chemical analyses will be performed by Kiber's subcontract laboratory, Acura. Acura's Quality Assurance Plan is provided in Appendix B.

The project Data Quality Objectives (DQOs) are defined in Tables 6-1 and 6-2. The analytical laboratory will follow QA/QC protocols in accordance with the test methods (e.g., method blanks, laboratory control samples, surrogate spikes, etc.) using DQO Levels I, II, and III. The treatability laboratory will perform replicate tests for in-house measurements, and will submit replicate samples to the analytical laboratory to assess overall reliability of the project data. Key personnel who will be involved with these assessments are provided in Table 6-3. Test methods, the number of tests, and sample handling requirements are identified in Tables 6-4 and 6-5. The parent sample collected in the field will NOT be preserved with methanol as this would compromise the integrity of the samples with respect to the treatability tests. The parent sample will be shipped to the laboratory in a refrigerated truck to reduce the potential loss of VOCs after sample collection.



---

## 7.0 SCHEDULE AND DELIVERABLES

A project schedule is shown on Figure 7-1. Sampling will be coordinated with the USEPA Project Manager to allow sampling oversight (if required) by USEPA. Treatability testing will be performed in a phased manner, with intermediate data interpretation and decision points. The work, including preparation of the Treatability Study Report, is expected to require approximately 36 weeks following USEPA approval of this work plan.

A Treatability Report will be submitted to USEPA for review within eight weeks of completion of the treatability and analytical testing by the laboratories. The report will document the objectives, methods, and results of the work. Specifically, the report will include the following:

- Description of the project site, the waste stream to be treated, the treatment technologies being evaluated, and the objectives of the testing;
- Sampling procedures used in the field and the laboratory;
- Apparatus and procedures used to conduct the treatability tests;
- Tables summarizing the test results;
- An assessment of the data quality and usability to support the task decisions;
- Identification of intermediate decision points in the treatability program and their outcome;
- The selected treatment train and formulations; and
- Implications for full-scale implementation such as required duration of any air stripping, S/S agent curing times, as well as anticipated volume increase.

Lab testing reports will be included as appendices, which will have limited distribution.

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Golder Associates, 1997a. Focused Feasibility Study Investigation Work Plan, First Operable Unit Fill, 216 Paterson Plank Road Site, Carlstadt, New Jersey, May 1997.

Golder Associates, 1997b. Focused Feasibility Study Investigation Report, 216 Paterson Plank Road Site, Carlstadt, New Jersey, November 1997.

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**TABLE 1-1**  
**SUMMARY OF CHEMISTRY ANALYSIS DETECTIONS**  
**SLUDGE "HOT-SPOT" SAMPLES**  
**216 PATERSON PLANK ROAD SITE**  
**ORGANIC DETECTIONS - VOLATILES**

EPA INITIAL PRGs (1) (mg/kg)	PARAMETER	B-1B Sampled:8/6/97	GBR-02B Sampled:8/18/97	GBR-02C Sampled:8/18/97	GB-4B Sampled:8/11/97	GB-4D Sampled:8/11/97	FGB-4D (Dup.) Sampled:8/11/97
		RESULT (mg/kg)	RESULT (mg/kg)	RESULT (mg/kg)	RESULT (mg/kg)	RESULT (mg/kg)	RESULT (mg/kg)
198	Benzene	-	28	38	34	73	66
1,220,000	2-Butanone	-	-	-	-	260	-
40,000	Chlorobenzene	8.4	86	74	380	1,200	1,000
940	Chloroform	-	-	-	54	30	31
200,000	1,1-Dichloroethane	3.4	-	-	51	210	160
---	Total 1,2-Dichloroethene	4.2	-	-	30	24	-
62	1,2-Dichloroethane	-	-	-	-	-	-
200,000	Ethylbenzene	110	420	350	940	1,100	970
760	Methylene Chloride	-	38	38	52	100	100
---	4-Methyl-2-Pentanone	19	-	97	190	460	420
184,000	1,1,1-Trichloroethane	-	-	-	430	150	150
110	Tetrachloroethene	330	1,200	880	5,200	6,200	4,600
400,000	Toluene	470	2,200	1,800	4,700	5,900	4,500
520	Trichloroethene	520	2,400	1,600	6,000	6,700	5,500
3	Vinyl chloride	-	-	58	-	-	-
4,000,000	Total Xylenes	720	2,600	2,100	5,300	5,700	5,200

Notes:

Units are in mg/kg.

(1) - EPA initial Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.

All results reported on a wet weight basis.

"---" indicates that no initial PRG is available.

Indicates exceedance of the EPA initial PRG.

"-" indicates that the constituent was not detected as qualified with a "U" or "UJ".

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**TABLE 1-1**  
**SUMMARY OF CHEMISTRY ANALYSIS DETECTIONS**  
**SLUDGE "HOT-SPOT" SAMPLES**  
**216 PATERSON PLANK ROAD SITE**  
**ORGANIC DETECTIONS - VOLATILES**

EPA INITIAL PRGs (1) (mg/kg)	PARAMETER	GB-6D	GB-7F	GB-14C
		Sampled:8/11/97 RESULT (mg/kg)	Sampled:8/12/97 RESULT (mg/kg)	Sampled:8/15/97 RESULT (mg/kg)
198	Benzene	57	62	28
1,220,000	2-Butanone	340	370	57
40,000	Chlorobenzene	260	260	49
940	Chloroform	240	340	-
200,000	1,1-Dichloroethane	120	-	16
---	Total 1,2-Dichloroethene	49	28	-
62	1,2-Dichloroethane	-	340	-
200,000	Ethylbenzene	1,100	1,100	100
760	Methylene Chloride	200	450	-
---	4-Methyl-2-Pentanone	440	470	42
184,000	1,1,1-Trichloroethane	1,200	2,700	-
110	Tetrachloroethene	6,000	8,900	370
400,000	Toluene	5,700	6,700	410
520	Trichloroethene	7,300	8,900	99
3	Vinyl chloride	-	-	44
4,000,000	Total Xylenes	6,100	5,700	550

Notes:

Units are in mg/kg.

(1) - EPA Initial Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.

All results reported on a wet weight basis.

"---" indicates that no initial PRG is available.

Indicates exceedance of the EPA initial PRG.

"-" indicates that the constituent was not detected as qualified with a "U" or "UJ".

101977

**TABLE 1-2**  
**SUMMARY OF CHEMISTRY ANALYSIS DETECTIONS**  
**SLUDGE "HOT-SPOT" SAMPLES**  
**216 PATERSON PLANK ROAD SITE**  
**ORGANIC DETECTIONS - SEMIVOLATILES**

EPA INITIAL PRGs (1) (mg/kg)	PARAMETER	B-1B Sampled:8/6/97 RESULT (mg/kg)	GBR-02B Sampled:8/18/97 RESULT (mg/kg)	GBR-02C Sampled:8/18/97 RESULT (mg/kg)	GB-4B Sampled:8/11/97 RESULT (mg/kg)	GB-4D Sampled:8/11/97 RESULT (mg/kg)	FGB-4D (Dup.) Sampled:8/11/97 RESULT (mg/kg)
		RESULT (mg/kg)	RESULT (mg/kg)	RESULT (mg/kg)	RESULT (mg/kg)	RESULT (mg/kg)	RESULT (mg/kg)
50,000	Phenol	1.7	56	72	48	64	70
184,000	1,2-Dichlorobenzene	0.6	14	8.4	34	28	19
---	1,4-Dichlorobenzene	0.33	-	-	-	-	-
---	2-Methylphenol	-	3.5	3.3	-	-	-
---	4-Methylphenol	0.46	13	15	18	15	16
1,020	Nitrobenzene	-	-	-	-	-	-
6,000	Isophorone	1.4	50	13	-	14	8.7
40,000	2,4-Dimethylphenol	-	12	11	9.9	-	9
20,000	1,2,4-Trichlorobenzene	0.081	2.3	0.95	3.3	3	2
82,000	Napthalene	1.1	51	18	75	52	30
---	2-Methylnapthalene	0.51	21	6.5	25	18	12
---	2-Chloronapthalene	-	55	40	31	22	16
2,000,000	Dimethylphthalate	-	-	-	2.4	-	-
122,000	Acenaphthene	-	1.6	-	0.89	-	-
---	Dibenzofuran	0.16	5.4	2.1	2.6	3.2	2
1,640,000	Diethylphthalate	-	-	-	12	1.2	1.5
82,000	Fluorene	0.077	3.2	0.89	1.2	1.6	1.2
---	Phenanthrene	0.24	12	4.3	4.1	4.2	2.8
620,000	Anthracene	-	1.8	-	-	-	-
---	Carbazole	-	0.92	-	-	-	-
---	Di-n-butylphthalate	0.37	-	-	52	8.7	9.1
82,000	Fluoranthene	-	6.9	1.8	2.5	2	1.3
62,000	Pyrene	-	4.6	1.1	1.6	1.8	0.98
400,000	Butylbenzylphthalate	0.043	-	-	20	2.2	2.9
7.8	Benzo(a)anthracene	-	2.4	0.55	0.9	0.59	0.47
78,000	Chrysene	-	3	0.72	1.1	1.1	0.81
400	Bis(2-ethylhexyl)phthalate	7.3	37	8.5	600	190	110
40,000	Di-n-octylphthalate	0.5	-	-	23	4.5	4.7
7.8	Benzo(b)fluoranthene	0.069	2.3	-	0.82	0.7	-
78	Benzo(k)fluoranthene	0.068	1.6	-	0.62	0.49	-
0.78	Benzo(a)pyrene	-	1.2	-	-	-	-
7.8	Indeno(1,2,3-cd)pyrene	-	1.3	-	-	-	-
0.78	Dibenz(a,h)anthracene	-	1.1	-	-	-	-
---	Benzo(g,h,i)perylene	-	1.4	-	0.6	-	-

Notes:

Units are in mg/kg.

(1) - EPA initial Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.

All results reported on a wet weight basis.

"---" indicates that no initial PRG is available.

Indicates exceedance of the EPA initial PRG.

"-" indicates that the constituent was not detected as qualified with a "U", "UJ" or "R".

101978

**TABLE 1-2**  
**SUMMARY OF CHEMISTRY ANALYSIS DETECTIONS**  
**SLUDGE "HOT-SPOT" SAMPLES**  
**216 PATERSON PLANK ROAD SITE**  
**ORGANIC DETECTIONS - SEMIVOLATILES**

EPA INITIAL PRGs (1) (mg/kg)	PARAMETER	GB-6D	GB-7F	GB-14C
		Sampled:8/11/97 RESULT (mg/kg)	Sampled:8/12/97 RESULT (mg/kg)	Sampled:8/15/97 RESULT (mg/kg)
50,000	Phenol	140	95	25
184,000	1,2-Dichlorobenzene	57	130	3.4
---	1,4-Dichlorobenzene	-	-	-
---	2-Methylphenol	-	-	-
---	4-Methylphenol	24	20	5.6
1,020	Nitrobenzene	-	380	-
6,000	Isophorone	33	20	1.1
40,000	2,4-Dimethylphenol	19	10	4.7
20,000	1,2,4-Trichlorobenzene	5.7	-	-
82,000	Napthalene	73	57	3
---	2-Methylnapthalene	28	21	1.1
---	2-Chloronapthalene	97	35	23
2,000,000	Dimethylphthalate	-	-	-
122,000	Acenaphthene	-	-	-
---	Dibenzofuran	3.9	-	-
1,640,000	Diethylphthalate	4.2	13	-
82,000	Fluorene	2	-	-
---	Phenanthrene	6.3	5.5	-
620,000	Anthracene	-	-	-
---	Carbazole	-	-	-
---	Di-n-butylphthalate	42	56	-
82,000	Fluoranthene	3.7	-	-
62,000	Pyrene	3.6	-	-
400,000	Butylbenzylphthalate	19	37	-
7.8	Benzo(a)anthracene	1.7	-	-
78,000	Chrysene	2	-	-
400	Bis(2-ethylhexyl)phthalate	610	430	1.3
40,000	Di-n-octylphthalate	37	17	-
7.8	Benzo(b)fluoranthene	-	-	-
78	Benzo(k)fluoranthene	-	-	-
0.78	Benzo(a)pyrene	0.55	-	-
7.8	Indeno(1,2,3-cd)pyrene	0.79	-	-
0.78	Dibenz(a,h)anthracene	-	-	-
---	Benzo(g,h,i)perylene	1.2	-	-

Notes:

Units are in mg/kg.

(1) -EPA Initial Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.

All results reported on a wet weight basis.

"---" indicates that no initial PRG is available.

Indicates exceedance of the EPA initial PRG.

"-" indicates that the constituent was not detected as qualified with a "U", "UJ" or "R".

101979

**TABLE 1-3  
SUMMARY OF CHEMISTRY DETECTIONS  
SLUDGE "HOT-SPOT" SAMPLES  
216 PATERSON PLANK ROAD SITE  
PESTICIDE/PCB DETECTIONS**

EPA INITIAL PRGs (1) (mg/kg)	PARAMETER	B-1B	GBR-02B	GBR-02C	GB-4B	GB-4D	FGB-4D (Dup.)
		Sampled:8/6/97 RESULT (mg/kg)	Sampled:8/18/97 RESULT (mg/kg)	Sampled:8/18/97 RESULT (mg/kg)	Sampled:8/11/97 RESULT (mg/kg)	Sampled:8/11/97 RESULT (mg/kg)	Sampled:8/11/97 RESULT (mg/kg)
---	Endrine Ketone	-	-	-	-	-	12
0.34	Aldrin	1.6	-	-	-	-	-
0.36	Dieldrin	0.86	-	-	-	-	-
10-25	Aroclor-1242	49	390	300	770	800	680

## Notes:

Units are in mg/kg.

(1) - EPA Initial Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.

All results reported on a wet weight basis.

"---" indicates that no initial PRG is available.

Indicates exceedance of the EPA initial PRG.

"-" indicates that the constituent was not detected as qualified with a "U", "UJ" or "R".

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**TABLE 1-3  
SUMMARY OF CHEMISTRY DETECTIONS  
SLUDGE "HOT-SPOT" SAMPLES  
216 PATERSON PLANK ROAD SITE  
PESTICIDE/PCB DETECTIONS**

EPA INITIAL PRGs (1) (mg/kg)	PARAMETER	GB-6D	GB-7F	GB-14C
		Sampled:8/11/97 RESULT (mg/kg)	Sampled:8/12/97 RESULT (mg/kg)	Sampled:8/15/97 RESULT (mg/kg)
---	Endrine Ketone	-	-	-
0.34	Aldrin	-	-	-
0.36	Dieldrin	-	-	-
10-25	Aroclor-1242	1,400	1,300	82

Notes:

Units are in mg/kg.

(1) - EPA Initial Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.

All results reported on a wet weight basis.

"---" indicates that no initial PRG is available.

Indicates exceedance of the EPA initial PRG.

"-" indicates that the constituent was not detected as qualified with a "U", "UJ" or "R".

101981



**TABLE 1-4**  
**SUMMARY OF CHEMISTRY ANALYSIS DETECTIONS**  
**SLUDGE "HOT-SPOT" SAMPLES**  
**216 PATERSON PLANK ROAD SITE**  
**INORGANIC DETECTIONS**

EPA INITIAL PRGs (1) (mg/kg)	PARAMETER	B-1B Sampled:8/6/97	GBR-02B Sampled:8/18/97	GBR-02C Sampled:8/18/97	GB-4B Sampled:8/11/97	GB-4D Sampled:8/11/97	FGB-4D (Dup.) Sampled:8/11/97
		RESULT (mg/kg)	RESULT (mg/kg)	RESULT (mg/kg)	RESULT (mg/kg)	RESULT (mg/kg)	RESULT (mg/kg)
---	Aluminum	5,140	5,040	3,090	4,270	3,890	3,800
820	Antimony	1.4	1.3	2.7	10.1	8.1	7.4
3.2	Arsenic	11.2	4.0	6.1	12.7	9.3	7.6
---	Barium	349	91.6	119	590	637	653
1.34	Beryllium	0.41	0.56	0.86	1.80	1.30	1.30
1,020	Cadmium	147	6.4	10	43.4	52	39
---	Calcium	19,200	18,800	37,300	23,900	37,400	36,700
10,200 (VI)	Chromium	58	91.9	203	209	265	255
---	Cobalt	2.9	2.7	1.9	5.6	4.7	4.2
76,000	Copper	5,760	975	2,590	6,350	4,180	4,250
---	Iron	9,830	6,140	4,920	13,600	11,400	10,000
500-1,000	Lead	245	228	479	947	999	985
---	Magnesium	2,780	1,340	5,280	2,260	3,280	3,240
---	Manganese	124	80.7	123	189	181	168
620	Mercury	2.2	7.5	2.9	4.7	4.4	3.7
40,000	Nickel	10.5	9.9	12.8	16.7	19.9	18.9
---	Potassium	395	625	480	507	537	529
10,200	Selenium	3.8	-	1.1	1.7	2.2	2.0
10,200	Silver	0.53	2.8	4.9	1.4	6.9	7.2
---	Sodium	6,550	35,800	44,500	10,100	28,000	28,200
144	Thallium	-	-	-	-	-	-
---	Vanadium	12.3	12.9	12.3	19.2	17.5	16.7
620,000	Zinc	242	268	365	1,840	2,260	2,500

Notes:

Units are in mg/kg.

(1) - EPA Initial Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services. All results reported on a wet weight basis.

"---" indicates that no initial PRG is available.

Indicates exceedance of the EPA initial PRG.

"-" indicates that the constituent was not detected as qualified with a "U" or "UJ".

101982

**TABLE 1-4**  
**SUMMARY OF CHEMISTRY ANALYSIS DETECTIONS**  
**SLUDGE "HOT-SPOT" SAMPLES**  
**216 PATERSON PLANK ROAD SITE**  
**INORGANIC DETECTIONS**

EPA INITIAL PRGs (1) (mg/kg)	PARAMETER	GB-6D	GB-7F	GB-14C
		Sampled:8/11/97 RESULT (mg/kg)	Sampled:8/12/97 RESULT (mg/kg)	Sampled:8/15/97 RESULT (mg/kg)
---	Aluminum	4,830	2,660	3,990
820	Antimony	6.0	12.8	1.2
3.2	Arsenic	10.8	9.3	5.1
---	Barium	619	702	68.3
1.34	Beryllium	1.0	0.72	2.50
1,020	Cadmium	34.1	47.4	6.7
---	Calcium	25,600	19,800	21,900
10,200 (VI)	Chromium	260	233	71.5
---	Cobalt	4.4	4.5	1.4
76,000	Copper	2,970	1,830	10,200
---	Iron	12,000	22,700	3,370
500-1,000	Lead	813	1,320	152
---	Magnesium	2,550	1,420	5,260
---	Manganese	198	153	81.1
620	Mercury	6.2	3.1	0.79
40,000	Nickel	14.8	12.4	7.6
---	Potassium	496	300	443
10,200	Selenium	1.1	2.0	-
10,200	Silver	1.4	1.8	0.6
---	Sodium	13,900	8,540	35,500
144	Thallium	-	-	-
---	Vanadium	18.9	19.3	6.7
620,000	Zinc	2,980	10,000	218

## Notes:

Units are in mg/kg.

(1) -EPA Initial Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services. All results reported on a wet weight basis.

"---" indicates that no initial PRG is available.

Indicates exceedance of the EPA initial PRG.

"-" indicates that the constituent was not detected as qualified with a "U" or "UJ".

101983

**SUMMARY OF CHEMISTRY ANALYSIS DETECTIONS  
SLUDGE "HOT-SPOT" SAMPLES  
216 PATERSON PLANK ROAD SITE  
ADDITIONAL PARAMETERS**

INITIAL EPA PRGs (1) (mg/kg)	PARAMETER						
		B-1B Sampled:8/6/97	GBR-02B Sampled:8/18/97	GBR-02C Sampled:8/18/97	GB-4B Sampled:8/11/97	GB-4D Sampled:8/11/97	FGB-4D (Dup.) Sampled:8/11/97
		RESULT (mg/kg)	RESULT (mg/kg)	RESULT (mg/kg)	RESULT (mg/kg)	RESULT (mg/kg)	RESULT (mg/kg)
---	Oil and Grease, Gravimetric	(2)	19000	42000	50900	44800	41300
---	Oil and Grease, Infrared	18700	27000	28300	83700	21900	17800
---	TOC	16000	31700	36600	53500	61500	52600

## Notes:

Units are in mg/kg.

(1) - Initial EPA Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.

(2) - Analysis not performed.

All results reported on a wet weight basis (sludge) except for sample B-1B.

"---" indicates that no initial PRG is available.

Indicates exceedance of the initial EPA PRG.

"-" indicates that the constituent was not detected as qualified with a "U" or "UJ".

101984

**SUMMARY OF CHEMISTRY ANALYSIS DETECTIONS  
SLUDGE "HOT-SPOT" SAMPLES  
216 PATERSON PLANK ROAD SITE  
ADDITIONAL PARAMETERS**

INITIAL EPA PRGs (1) (mg/kg)	PARAMETER	GB-6D	GB-7F	GB-14C
		Sampled:8/11/97	Sampled:8/12/97	Sampled:8/15/97
		RESULT (mg/kg)	RESULT (mg/kg)	RESULT (mg/kg)
---	Oil and Grease, Gravimetric	57200	106000	76900
---	Oil and Grease, Infrared	38400	47800	3040
---	TOC	62900	30600	30800

## Notes:

Units are in mg/kg.

(1) - Initial EPA Preliminary Remediation Goals (PRGs) taken from a letter dated November 19, 1993 from EPA to Langan Environmental Services.

(2) - Analysis not performed.

All results reported on a wet weight basis (sludge) except for sample B-1B.

"---" indicates that no initial PRG is available.

 Indicates exceedance of the initial EPA PRG.

"-." indicates that the constituent was not detected as qualified with a "U" or "UJ".

101985

**SUMMARY OF DATA QUALITY OBJECTIVES  
SLUDGE "HOT-SPOT" TREATABILITY STUDY  
216 PATERSON PLANK ROAD SITE**

Testing/Activity	Objective	Rationale	DQO Analytical Level <sup>(1)</sup>
Field Sampling (Phase I)	Collect worst-case (highest VOC/PCB concentration) material for treatability testing.	Treatment of Hot Spot requires testing of worst-case material.	N/A
Initial (Baseline) Characterization (Phase I)	Characterize initial properties of parent material prior to treatment and assess any variability.	Test for all properties that may be run on treated samples. Assess any variability in parent material through replicate analyses.	I, III, Other
Screening of Solidification/Stabilization (Phase II)	Identify formulations of sludge with cement and/or clay that will yield a solidified material with the necessary physical strength.	Test matrix of sludge/cement/clay in various ratios. Test strength during curing with penetrometer.	Other
Evaluation of Air Stripping (Phase III)	Evaluate the utility of air stripping for removal of VOCs as a pre-treatment prior to solidification/stabilization.	Simulate field air-stripping conditions using bench-top equipment, measure VOCs in off-gas and soil, evaluate mass transfer and rate.	I, III
Evaluation of Zero-Valent Iron (Phase III)	Evaluate whether zero-valent iron provides significant treatment of chlorinated organics.	Test samples treated with cement and clay solidification/stabilization agents amended with iron. Evaluate reduction in total constituent concentration and in SPLP extract concentration.	I, III

**SUMMARY OF DATA QUALITY OBJECTIVES  
SLUDGE "HOT-SPOT" TREATABILITY STUDY  
216 PATERSON PLANK ROAD SITE**

<b>Testing/Activity</b>	<b>Objective</b>	<b>Rationale</b>	<b>DQO Analytical Level <sup>(1)</sup></b>
Verification Testing (Phase IV)	Evaluate overall degree of treatment for selected treatment process(es).	Test untreated sample as well as sample treated using processes and agents selected from Phase II and III testing, determine reduction in total constituent concentrations and SPLP extract concentrations for VOCs and PCBs. Determine physical characteristics of treated material.	I, III, Other

(1) See Table 6-2 for definition of DQO Analytical Levels.

101987

**LEVELS OF QUALITY ASSURANCE AND ANALYTICAL DATA METHODOLOGIES  
SLUDGE "HOT-SPOT" TREATABILITY STUDY  
216 PATERSON PLANK ROAD SITE**

Level	Description	Associated Treatability Testing
I	Level I is the lowest quality data but provides the fastest results. Field screening or analysis provides Level I data. It can be used for health and safety monitoring and preliminary screening of samples to identify those requiring confirmation sampling. The generated data can indicate the presence or absence of certain constituents and is generally qualitative rather than quantitative. It is the least costly of the analytical options.	- Total organic vapor analyzer, pH meter
II	Level II data are generated by field laboratory analysis using more sophisticated portable analytical instruments or a mobile laboratory onsite. This provides fast results and better-quality data than in Level I. The analyses can be used to direct a removal action in an area, re-evaluate sampling locations, or direct installation of a monitoring well network.	- Not Applicable
III	Level III data may be obtained by a commercial laboratory with or without CLP procedures. (The laboratory may or may not participate in the CLP.) The analyses do not usually use the validation or documentation procedures required of CLP Level IV analysis. The analyzed parameters are relevant to site characterization risk assessment, and design of the remedial action.	- Total constituent analyses and SPLP extract analyses for VOCs and PCBs.
IV	Level IV data are used for risk assessment, engineering design, and cost-recovery documentation. All analyses are performed in a CLP analytical laboratory and follow CLP procedures. Level IV is characterized by rigorous QC protocols, documentation, and validation.	- Subsurface sludge and/or FOU fill material analysis of TCL parameters.
V	Level V data are those obtained by nonstandard analytical procedures. Method development or modification may be required for specific constituents or detection limits.	- Not Applicable
OTHER	Other Methodologies not described above.	- Geotechnical Parameters

**TABLE 6-3**  
**KEY PERSONNEL**  
**SLUDGE "HOT-SPOT" TREATABILITY STUDY**  
**216 PATERSON PLANK ROAD SITE**

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Facility Coordinator 216 Paterson Plank Road Cooperating PRP Group	P. Stephen Finn Golder Associates Inc. 305 Fellowship Rd. Suite 200 Mt. Laurel, NJ 08054 Telephone: (609) 273-1110 Facsimile: (609) 273-0778
Golder Project Manager:	Robert J. Illes Golder Associates Inc. 305 Fellowship Rd. Suite 200 Mt. Laurel, NJ 08054 Telephone: (609) 273-1110 Facsimile: (609) 273-0778
Golder Quality Assurance Officer:	Lori Anne Hendel Golder Associates Inc. 305 Fellowship Rd. Suite 200 Mt. Laurel, NJ 08054 Telephone: (609) 273-1110 Facsimile: (609) 273-0778
Golder Laboratory Coordinator:	Doug Dugan Golder Associates Inc. 305 Fellowship Rd. Suite 200 Mt. Laurel, NJ 08054 Telephone: (609) 273-1110 Facsimile: (609) 273-0778
Treatability Laboratory Project Manager:	Robert Semenak Kiber Environmental Services, Inc. 3145 Medlock Bridge Road Norcross, GA 30071 Telephone: (770) 242-4090 Facsimile: (770) 242-9198
Analytical Laboratory Project Manager:	Jim Reisch Accura Analytical Laboratory, Inc. 6017 Financial Drive Norcross, GA 30071 Telephone: (770) 449-8800 (ext. 208) Facsimile: (770) 449-5977



**TABLE 6-4**  
**SUMMARY OF TEST PROCEDURES**  
**SLUDGE "HOT-SPOT" TREATABILITY STUDY**  
**216 PATERSON PLANK ROAD SITE**

Test Procedure	Test Methods*	Total Number of Tests on Each Sample			
		Phase I	Phase II	Phase III	Phase IV
Total Solids	EPA 160.1 ASTM D2216-80	3	0	0	2
Free Liquid	SW846, Method 9095	3	0	0	2
Bulk Density	ASTM D5057; Other as appropriate	3	0	0	2
pH	SW846, Method 9045	3	0	0	2
Moisture Content	ASTM D2216	3	0	0	2
Total Constituent Analysis VOC/PCB/METALS	SW846, Methods 8260 and 8082	3/3/0	0	10/8/0	2/2/2
SPLP, Organics VOC/PCB/METALS	SW846, Methods 1312 followed by 8260 & 8082	3/3/0	0	10/8/0	2/2/2
VOCs in Off-Gas	USEPA 8260 (Modified)	0	0	1	1
Penetration Resistance	Pocket Penetrometer; ASTM C403-80	3	TBD	TBD	TBD
Unconfined Compressive Strength	ASTM D2166	3	1	0	2

**NOTES:**

\* "SW846 refers to EPA Manual SW846

TBD = To Be Determined

Phase IV tests are for each treatment train evaluated.

**TABLE 6-5**  
**PARCC DATA FOR NON-AQUEOUS SAMPLES**  
**SLUDGE "HOT-SPOT" TREATABILITY STUDY**  
**216 PATERSON PLANK ROAD SITE**

MEASUREMENT PARAMETER	METHOD REFERENCE	HOLDING TIME	LABORATORY PRECISION	SAMPLING & LABORATORY PRECISION	ACCURACY	COMPLETENESS (a)
Volatile Organics-TCL	EPA-8260	10 days	+/- 20%	+/- 100%	75-125%	85%
PCB-TCL	EPA-8082	7 days (b)	+/- 20%	+/- 100%	75-125%	85%
Particle Size Analysis	ASTM D-421/422	NA	NA	NA	NA	85%
Moisture Content	ASTM D-2216	NA	NA	NA	NA	85%
Unconfined Compressive Strength	ASTM D-2166	NA	NA	NA	NA	85%
pH	LaMotte	NA	NA	NA	NA	85%

**NOTES:**

NA = Not applicable

TCL = Target Compound List

ASTM = American Society for Testing and Materials, Volume 04.08, 1990.

Precision expressed as either percent relative standard deviation (RSD) or relative percent difference (%RPD).

Accuracy expressed as percent recovery of matrix spike or laboratory control sample.

Representativeness and Comparability are non-quantitative parameters.

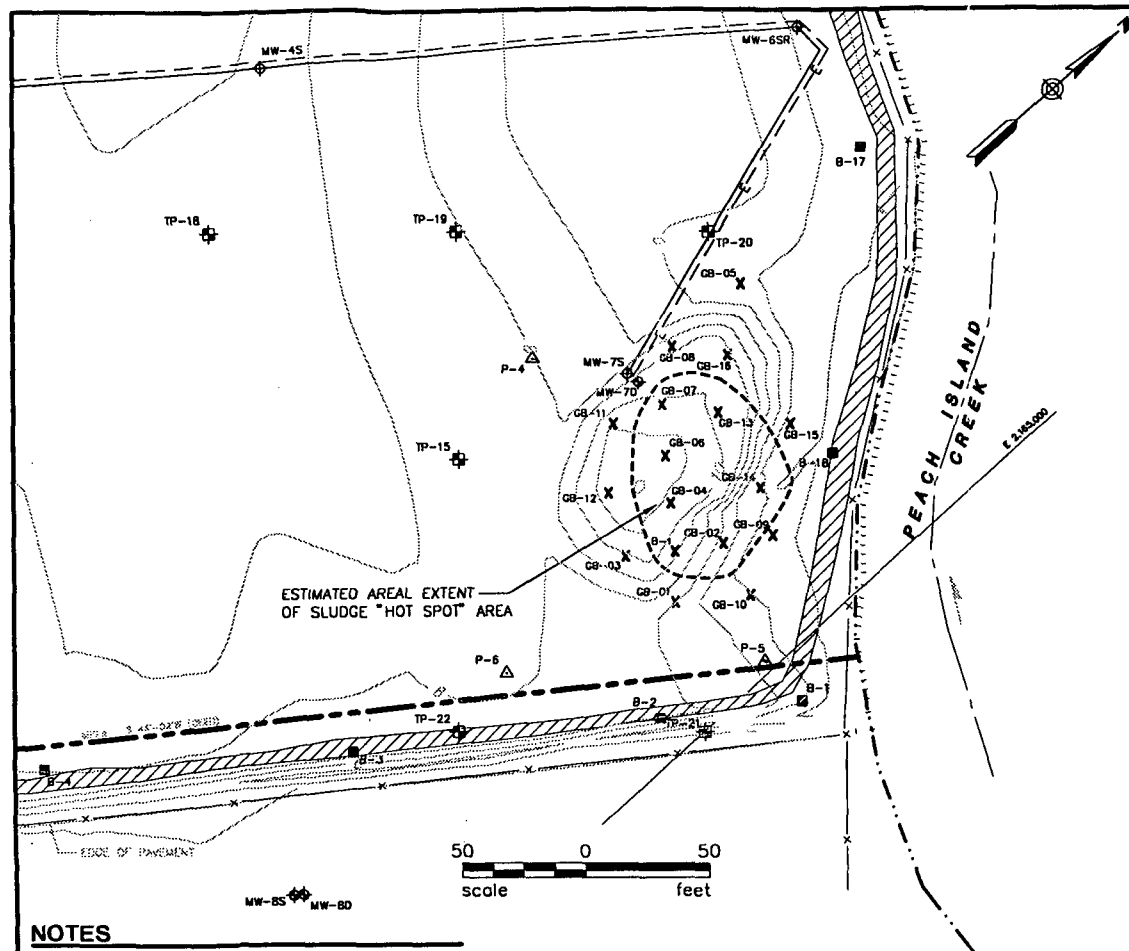
Field and laboratory precision based upon Region II validation guidelines.

(a) While the goal for completeness of laboratory measurements is 90%, the goal for total completeness (sampling and analytical) is 85%.

(b) 7 days for extraction, 40 days for analysis after commencement date of extraction.

(c) Off-gas samples will be analyzed for VOCs using a modified EPA Method 8260.

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ESTIMATED AREAL EXTENT  
OF SLUDGE "HOT SPOT" AREA

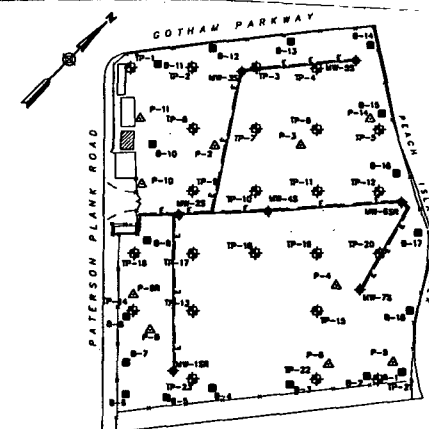
50 0 50  
scale feet

### NOTES

- 1) COORDINATE SYSTEM SHOWN IS NEW JERSEY STATE PLANE NAD27 AND VERTICAL DATUM BASED ON NAVD 1929.
- 2) LOCATION OF SLURRY WALL INVESTIGATION BORINGS AND TEST PIT LOCATIONS BY OTHERS ARE APPROXIMATE. BORING & TEST PIT LOCATIONS WERE PREVIOUSLY SURVEYED USING A SITE SPECIFIC COORDINATE SYSTEM.

### REFERENCE

- 1) TOPOGRAPHIC DATA AND SURFACE FEATURES BASED ON INFORMATION BY TAYLOR, WISOMAN & TAYLOR CONSULTING ENGINEERS/SURVEYORS/PLANNERS/LANDSCAPE ARCHITECTS, MOUNT LAUREL, NEW JERSEY, DATED 06/12/92, SCALE 1"=40'.
- 2) MONITORING WELLS, PIEZOMETERS, AND EXTRACTION WELLS SURVEYED BY GEOO CORPORATION, NEWFUNDLAND, NJ IN OCTOBER 1996 AND SOIL BORINGS IN AUGUST 1997.
- 3) SLURRY WALL BORINGS AND FEATURES FROM THE INTERIM REMEDIAL MEASURES TAKEN FROM CHRONIC ENVIRONMENTAL 1992 "INTERIM REMEDY FOR FIRST OPERABLE UNIT", AUGUST 1992.
- 4) DAMES & MOORE, 1990, "FINAL REPORT - REMEDIAL INVESTIGATION SOP SITE, CARLSTADT, NEW JERSEY", MARCH 1, 1990.
- 5) DAMES & MOORE, 1989, - "TEST PIT INVESTIGATION SOP / CARLSTADT JULY 1989 CARLSTADT, NEW JERSEY", AUGUST 4, 1989.



KEY MAP

200 0 200  
scale feet

### LEGEND

- GB-01 X SOIL BORING LOCATION (COMPLETED AS PART OF THE FFS INVESTIGATION)
- MW-80 Existing Monitoring Well (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- P-4 SHALLOW PIEZOMETER (INSTALLED DURING THE REMEDIAL INVESTIGATION)
- MW-45 EXTRACTION WELL (INSTALLED DURING THE REMEDIAL INVESTIGATION AND RETROFITTED FOR SHALLOW GROUNDWATER EXTRACTION AS PART OF THE IRM CONSTRUCTION)
- B-6 SLURRY WALL CONSTRUCTION INVESTIGATION BORING (INSTALLED DURING REMEDIAL DESIGN)
- TP-2 TEST PIT (INSTALLED DURING TEST PIT INVESTIGATION)
- PROPERTY/RIGHT-OF-WAY BOUNDARIES
- 1 FT. CONTOUR LINE (FT. ~ MSL)
- EDGE OF STREAM
- FENCE
- SLURRY WALL ALIGNMENT
- SHEET PILE WALL ALIGNMENT

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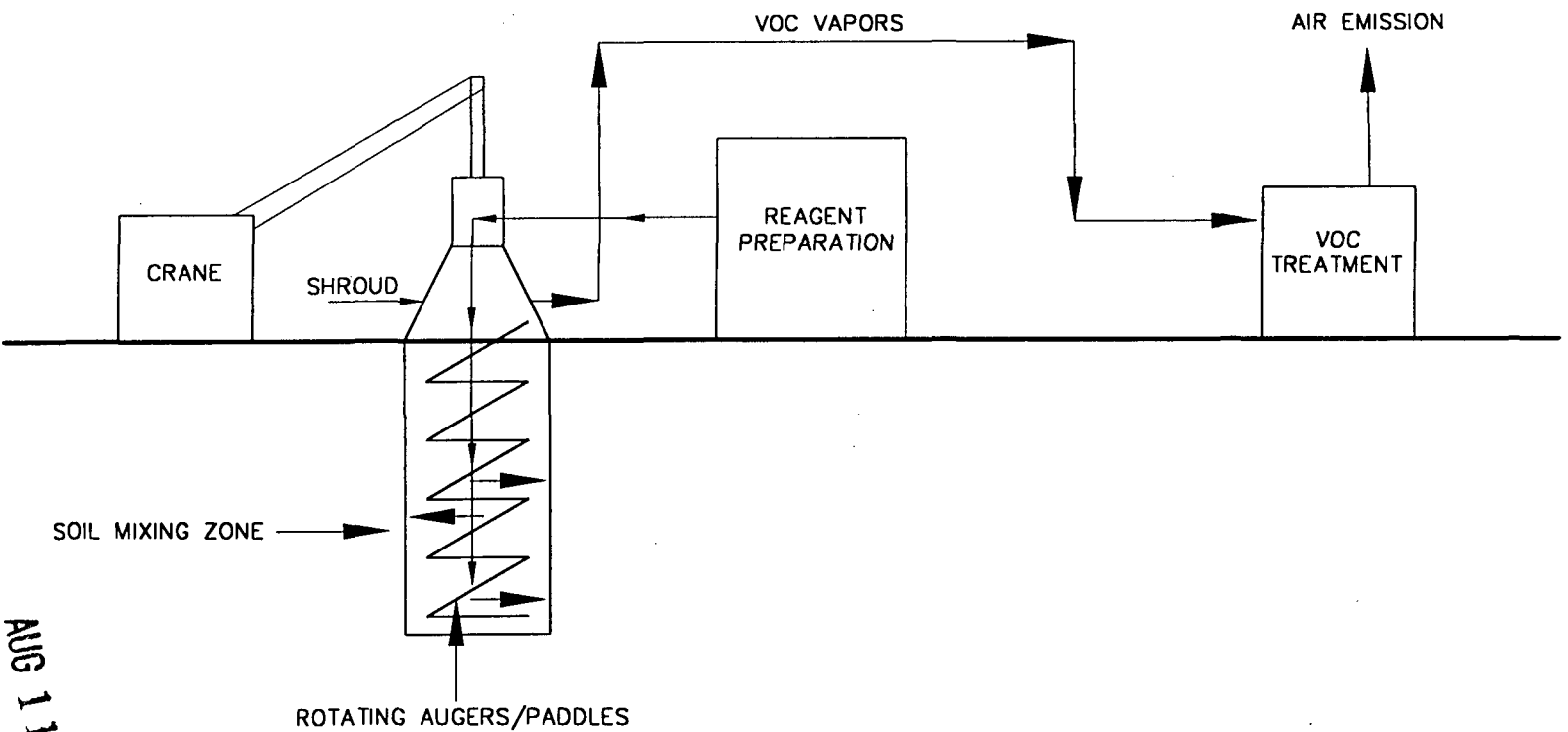
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DR BY:	TVL	DATE:	07/29/98
CHK BY:	RMG	FILE No:	NJ03-828
REV BY:		OR SUBTITLE:	14

**Golder Associates**

**ESTIMATED AREAL EXTENT OF  
SLUDGE "HOT SPOT" AREA**

216 PATERSON PLANK ROAD SITE

FIGURE 1-1



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JOB No.:	943-6222	SCALE:	NOT TO SCALE
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CHK BY:	RMG	FILE No.:	NJ03-829
REV BY:		DR SUBTITLE:	14

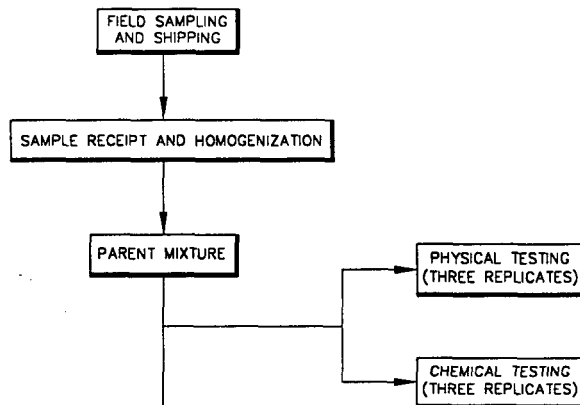
**GENERAL SCHEMATIC OF  
SOIL MIXING  
STABILIZATION PROCESS**

**Golder Associates**

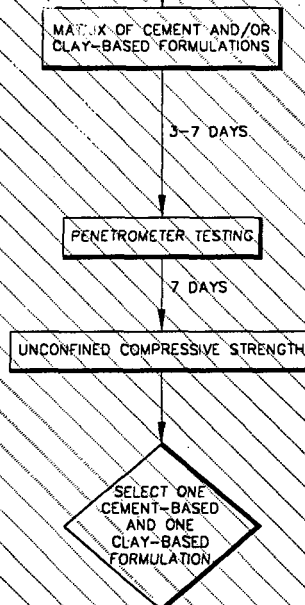
216 PATTERSON PLANK ROAD SITE

FIGURE 1-2

# PHASE I (BASELINE)

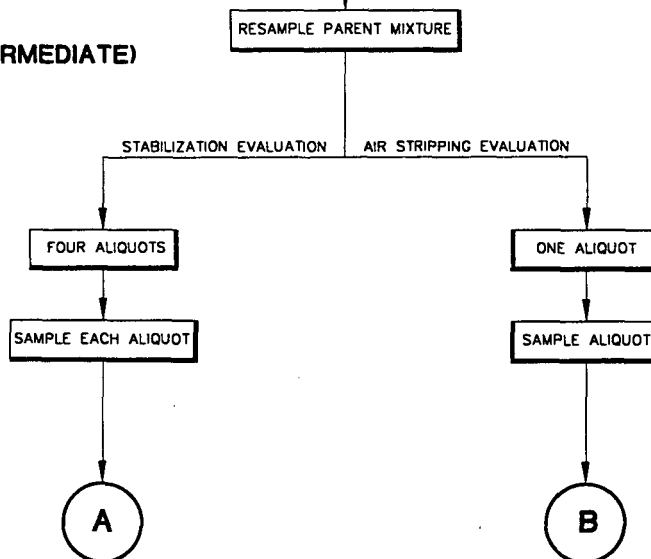


## PHASE II (SCREENING)



Goldier Associates	JOB NO.	943-6222	SCALE	N/A
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	CHK. BY:	[Signature]	FILE NO.:	NJ03-826
	REV. BY:		DR. SUBMIT:	14

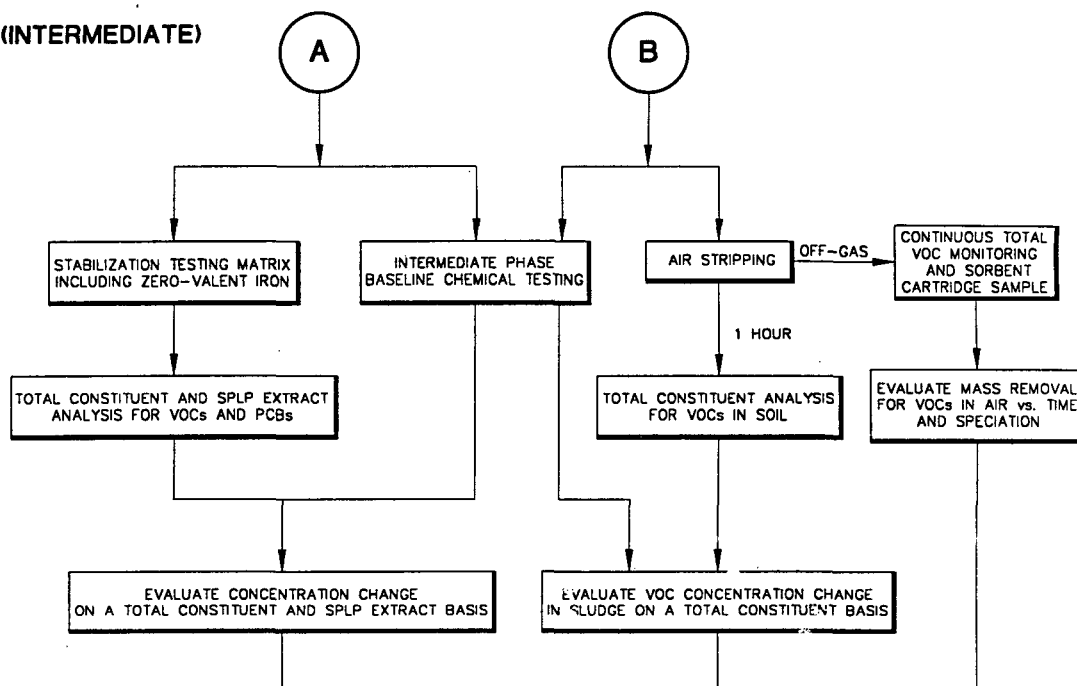
## PHASE III (INTERMEDIATE)



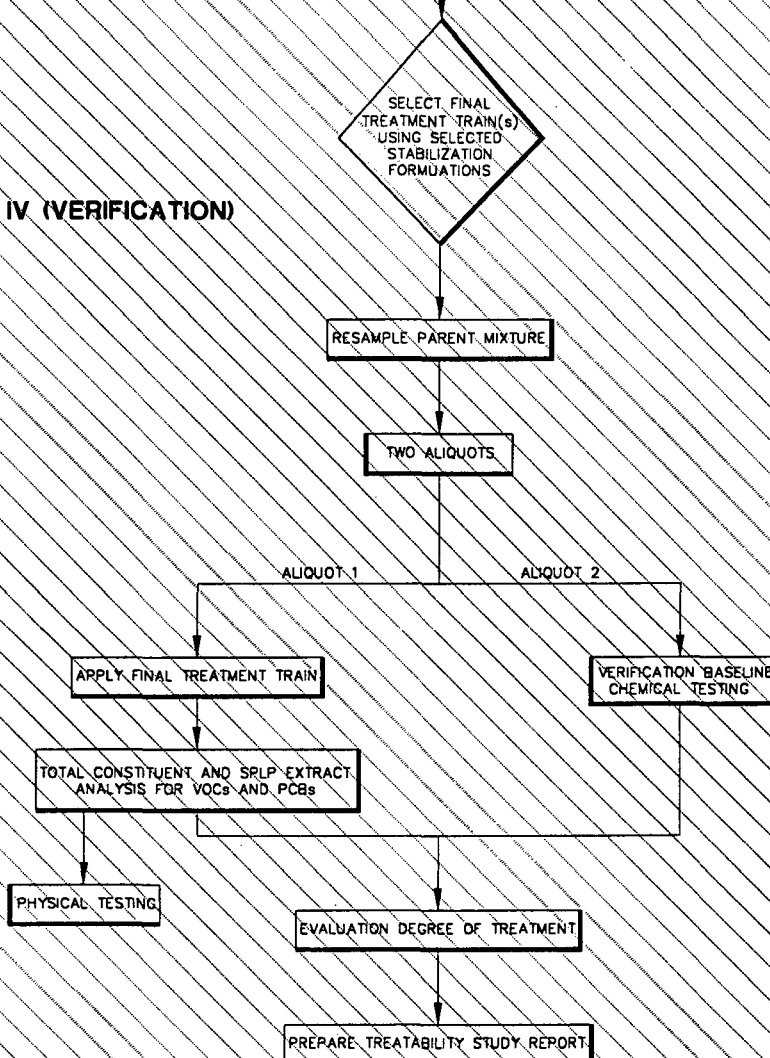
TREATABILITY TESTING PROGRAM  
216 PATERSON PLANK ROAD SITE  
3-1A

AUG 11 1998

# PHASE III (INTERMEDIATE)



## PHASE IV (VERIFICATION)



**Goldier Associates**

JOB NO.:	943-6222	SCALE:	N/A
DR. BY:	TVL	DATE:	07/29/98
CHK. BY:	PMG	FILE NO.:	NJ03-827
REV. BY:		DR. SUBTITLE:	14

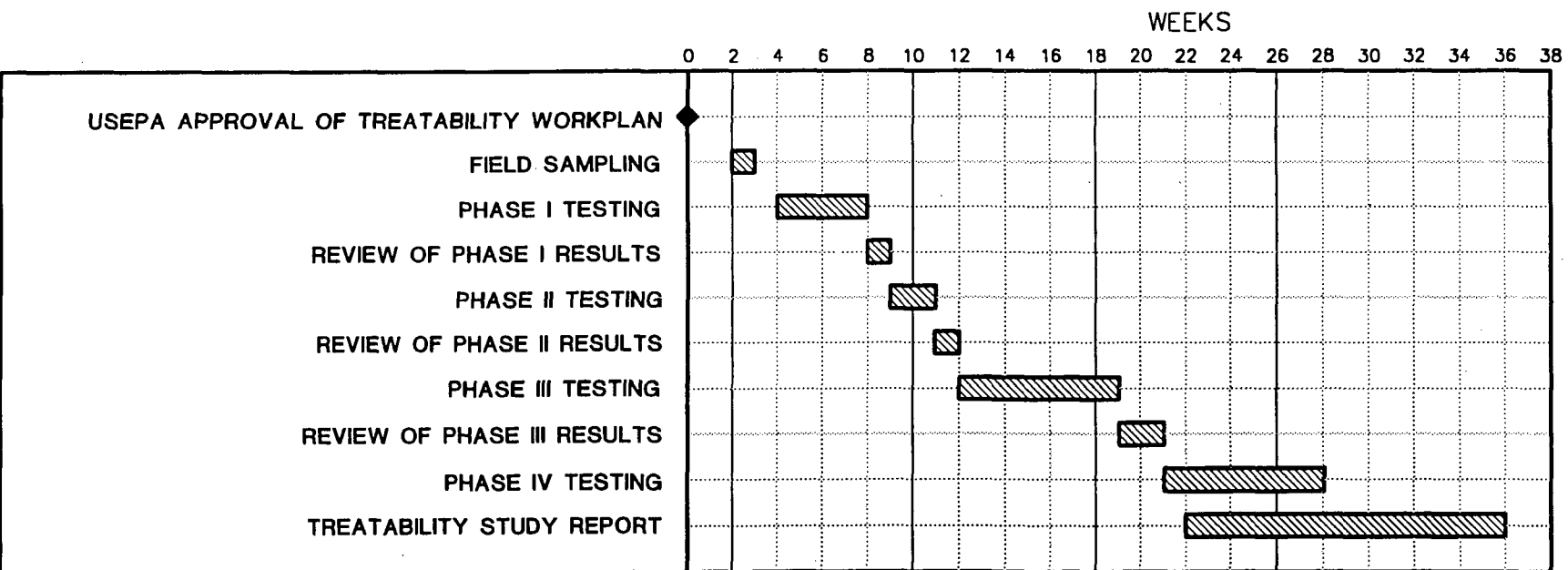
**TREATABILITY TESTING PROGRAM**

216 PATERSON PLANK ROAD SITE

FIGURE 3-1B

AUG 11 1998

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JOB NO.: 943-6222

SCALE: N/A

DR BY: TVL

DATE: 07/29/98

CHK BY: PMG

FILE NO.: NJ03-825

REV BY: DR SUBTITLE: 14

## TREATABILITY STUDY SCHEDULE

**Golder Associates**

216 PATERSON PLANK ROAD SITE

FIGURE

7-1

APPENDIX A  
Kiber Quality Assurance Plan






KIBER ENVIRONMENTAL SERVICES, INC.

*Presents its*

## CORPORATE QUALITY ASSURANCE PLAN

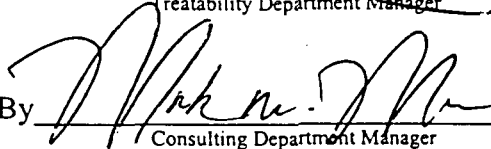
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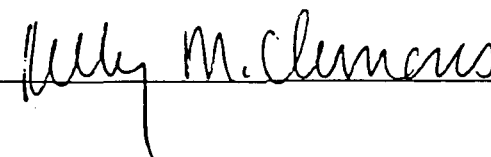
April 1998

Approved By  Date 5/14/98  
Chief Executive Officer

Approved By  Date 5/14/98  
President

Approved By  Date 5/14/98  
Treatability Department Manager

Approved By  Date 5/14/98  
Consulting Department Manager

Prepared By  Date 5/14/98

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### 3.0 STATEMENT OF POLICY

Kiber Environmental Services, Inc. (Kiber) offers on-site sampling services, site assessments, site remediation, treatability studies, geotechnical and environmental analyses.

This QA/QC Plan (QAP) presents the unifying focus on quality that transcends all technical service sections of Kiber: consulting, remediation, treatability, and geotechnical. The quality control procedures practiced at Kiber are strictly enforced according to the Quality Assurance program detailed in this QAP.

Kiber's corporate objective is to establish a structured corporate system where day to day practices occur consistently. Consistency in practices allows for continual improvement of any given system and thus yielding a high quality product. Training is the mechanism to express company policy and to guide day to day activities. The extensive training activities yield a well informed and prepared company capable of reporting valid and legally defensible data.

The combination of the structured corporate system, the day to day practices based on approved methodology, and a corporate focus on quality allows Kiber to offer clients precise, and accurate environmental services.

### 4.0 ORGANIZATION AND RESPONSIBILITY

Kiber's Corporate objective demands overall corporate organization. The organization is structured so a system of responsibility is developed company wide. This allows for corporate functional cohesiveness. Responsibility begins with the Chief Executive Officer (CEO) and is linked to every employee of the company through the chain of command.

#### 4.1 PERSONNEL AND RESPONSIBILITY

This section outlines the positions and responsibilities associated with key personnel. An organizational chart graphically depicting this arrangement is provided in Figure 1.

- **CHIEF EXECUTIVE OFFICER - K. TRACY BERGQUIST**

The Chief Executive Officer (CEO) plans, develops, and establishes policies and objectives of business organization following Board suggestions by doing or delegating the following duties:

- confers with company officials to plan business objectives, to develop organizational policies, to coordinate functions and operations between departments, and to establish responsibilities and procedures for attaining objectives
- Evaluates the goals established by each department for future growth and direction
- Reviews activity reports and financial statements to detect progress and status in attaining objectives and revises objectives and plans according to current conditions
- Directs and coordinates formulation of financial programs to provide funding

for new or continuing operations to maximize returns on investments and to increase productivity

- Plans and develops industrial, labor, and public relations policies designed to improve company's image and relations with customers, employees, stockholders, and public
- Evaluates President's performance for compliance with established policies and objectives of firm and contributions in attaining objectives

- **PRESIDENT - NEVILLE W. KINGHAM**

Plans, develops, and establishes policies and objectives of business organization following Chief Executive Officer directives by doing or delegating the following duties:

- Plans, develops, and implements organization policies and goals
- Coordinates activities of departments to affect operational efficiency and economy
- Directs and coordinates promotion of services to develop new markets, increase share of the market and obtain competitive position in industry
- Analyzes department budget request to identify areas in which reductions can be made and allocates operating budget
- Directs preparation of directives to department managers outlining policy, program, or operations changes to be implemented
- Manage subordinate supervisors in charge of the Treatability, Analytical, and Administrative departments by providing direction, coordination, and evaluation

- **CONTROLLER - TERESA McCRAY LEONARD**

Directs the financial activities of the organization by doing or delegating the following duties:

- Recommends to management major economic objectives and policies for company
- Prepares reports that summarize and forecast company business activity and financial position in areas of income, expenses, and earnings based on past, present, and expected operations
- Directs preparation of budgets
- Management of accounting department including payables and receivables, financial obligations, general ledger, payroll, asset and liability management and cash management
- Advises management about insurance coverage for protection against property losses and potential liabilities
- Manage relationships with major vendors and major service providers, i.e., insurance and banking.
- Directs determination of depreciation rates to apply to capital assets
- Advises management on desirable operational adjustments due to tax code revisions
- Responsible for job cost reporting and cost accounting for all company

departments

- Interfaces with senior management and board of directors and advise on financial issues

- **QUALITY ASSURANCE/QUALITY CONTROL OFFICER**

The QA/QC Officer conducts audits, training, surveillance, quality control tests, data review, corrective action procedures, quality investigations, and implements all laboratory policy and procedure. Specific responsibilities include the following:

- Verify calibration requirements for storage locations, ovens, weights, balances, etc.
- Determining if the levels of QA are being met for all projects
- Assuring the continuity of chain of custody evidence
- Compiling and submitting all Quality Assurance Reports (QARs)
- Compiling, revising, and submitting QAPs
- Reviewing subcontractors' project specific QAPs and Corporate QAPs
- Ongoing QA/QC training of new and current personnel

- **TREATABILITY DEPARTMENT MANAGER - ROBERT SEMENAK**

The Treatability Department Manager directs and coordinates day to day activities; allocates resources; administers company policy and procedures; reviews technical documents for clarity, completeness, and accuracy; develops reports on billings, personnel performance, and efficiency; and is responsible for the technical activities associated with each treatability and geotechnical project. Specific responsibilities are as follows:

- Develops and directs long range goals for the group
- Ensures projects are completed efficiently
- Reviews cost analysis, personnel resources and allocation, and provides information to controller and President
- Reviews technical reports developed by group and provides final approval
- Working knowledge of state and federal environmental regulations, and ability to help clients with regulatory agency interaction/negotiation
- Develop annual department budget
- Track monthly billings for the department
- Review letters, reports, etc. . . that are a product of the department before delivery
- Completes review on all proposals

- **CONSULTING DEPARTMENT MANAGER - MARK MARLOWE**

The Consulting Department Manager directs and coordinates day to day activities; allocates resources; administers company policy and procedures; reviews technical documents for clarity, completeness, and accuracy; develops reports on billings, personnel performance, and efficiency; and is responsible for the technical activities associated with each consulting project. Specific responsibilities are as follows:

- Develops and directs long range goals for the group



- Ensures projects are completed efficiently
  - Reviews cost analysis, personnel resources and allocation, and provides information to controller and President
  - Reviews technical reports developed by group and provides final approval
  - Working knowledge of state and federal environmental regulations, and ability to help clients with regulatory agency interaction/negotiation
  - Develop annual department budget
  - Track monthly billings for the department
  - Review letters, reports, etc . . . that are a product of the department before delivery
  - Completes review on all proposals
- **HEALTH AND SAFETY OFFICER**  
The Health and Safety Officer is responsible for establishing training material associated with industry requirements, implementing health and safety policy and procedure, ensuring that the proper protective equipment is available, maintaining all documentation with current information, and establishing any systems so that information is effectively distributed to employees. Responsibilities include the following:
- Conducts health and safety meetings
  - Maintains and implements the HAZCOM Plan and Chemical Hygiene Plan
  - Provides on-site training and establishes work zones following the site specific HASP
  - Supervises the development and implementation of the corporate and site-specific health and safety plans
  - Calibrates, maintains and uses field monitoring instrumentation to conduct site surveys
  - Maintain written logs of health and safety monitoring activities
  - Performs periodic safety audits

#### 4.2 TRAINING

Training for each employee is documented in the personnel training files. With the help of the "Training Supervisor Plus" software all employee training and scheduling of training is maintained. Each position at Kiber requires a level of training. The training plan of each position is summarized in training categories developed by the department managers, health and safety officers, and the QA/QC Officer. Each employee is assigned to a category to ensure that the proper new and refresher training is administered. The overall goal of training is to provide the guidance and communication necessary so that each employee performs in compliance to legal and corporate policies. Through the training program, Kiber has a tangible strategy for ensuring that an established level of assurance is achieved for all activities performed. Training may be provided by in house presentations or by outside experts. In house presentations are provided by supervisors, QA/QC officer, laboratory or field staffs who have proved proficiency in the procedure. Outside training is provided for new procedures, policies, regulations, or other related contract activities. Such training is conducted by a

regulatory agency or a representative with the necessary expertise to educate others on the course material and/or operation of equipment.

- 4.2.1 Training is performed at corporate meetings to educate employees on the corporate policies and procedures.
- 4.2.2 Health and Safety training is a more comprehensive program because of the various procedures practiced at Kiber.
  - 4.2.2.1 Employee information and training (29 CFR 1910.1450 (f)) on hazardous chemicals involves initial training and periodic refresher sessions. Examples of the periodic refreshers are safety and information seminars, outside sponsored seminars, and project meetings. Project meetings include a discussion of the Site Specific Health and Safety Plan outlining the site hazards and any specific on-site training that will be necessary to limit exposure and practice safely during activities. The frequency of project training is determined by the supervisors and the Corporate Health and Safety Officer.
  - 4.2.2.2 All personnel partaking in onsite activities will be provided the following training: initial 40 hour OSHA training, Annual 8-hour OSHA refresher training, CPR and First Aid training.
  - 4.2.2.3 All personnel partaking in confined space entry activities will be provided the OSHA Confined Space Entry training.
  - 4.2.2.4 Training is provided to applicable personnel covering the following items: 1) ways to detect the presence or release of a hazardous chemical; 2) the physical and chemical hazards in the workplace; 3) measures to take to protect from hazards; 4) personal protective equipment to use in a given situation; 5) an overview of toxicologies; 6) Occupational Health/Industrial Hygiene; 7) using and interpreting MSDS sheets; 8) proper labeling of containers, and emergency procedures to take if needed.
- 4.2.3 Kiber employees are aware of the emphasis on QA/QC practices in relation to the overall corporate objective. Such awareness enables every daily activity to be performed incorporating the quality controls and assurances necessary to meet the corporate objective. The specific QA/QC procedural training is covered in the Standard Operating Procedures (SOPs). Such SOPs cover sampling and laboratory procedures with the applicable quality controls, sample custody, and calibration procedures.

## 5.0 QUALITY ASSURANCE OBJECTIVES

The objectives and descriptions of objectives included in this section are developed in accordance with the unifying corporate theme on consistency.

### 5.1 TREATABILITY OBJECTIVES

The following outlines the sections of a typical Treatability report. Each final report will contain the information based on the scope of the study; and therefore, all sections may not always be applicable.

- Introduction
- Procedure
- Discussion of Results
- Conclusion
- Tables
- Figures
- Photographs
- Appendices (including COCs)

### 5.2 CONSULTING/REMEDATION OBJECTIVES

The following outlines the sections of a typical Consulting or Remediation report. Each final report will contain the information based on the scope of the study; and therefore, all sections may not always be applicable.

- Introduction
- Site History
- Site Description
- Site Service
- Discussion of Analytical Data
- Conclusions and Recommendations
- Figures
- Tables
- Appendices

### 5.3 ANALYTICAL DATA REQUIREMENTS

The following outlines the four levels of Analytical reporting that Kiber requires

#### 5.3.1 Level I

- Results w/units
- Analytes of interest
- Method number
- Practical Quantitation Limits (PQL)
- Cross reference list of client ID# and lab ID#
- Sample collection date
- Sample receipt date
- Prep/extraction/analysis dates
- Surrogate/tracer recoveries
- Method blanks for all analyses
- Chain-of-Custody

5.3.2 Level II All of Level I plus:

- Batch QC including:
- BS/BSD/MS/MSD for Organics as applicable
- MS/LCS/RPD for Inorganics as applicable
- Case Narrative

5.3.3 Level III All of Level II except:

- Project Specific QC in lieu of Batch QC

5.3.4 Level IV All of Level II or III plus:

- Raw data for samples, QC, calibrations and calculations
- Digestion/extraction logs
- Instrument run logs
- Percent solids worksheet (as applicable)
- Tuning data (GC/MS only)
- Interference check standard results (ICP)
- Serial Dilution check results (ICP)

5.4 DEFINITIONS OF QUALITY OBJECTIVES

All Kiber sections address the following data related definitions where applicable.

5.4.1 Completeness -- the adequacy in quantity of valid measurements verse total measurements. This measure is used to prevent misinterpretation.

5.4.2 Representativeness -- the extent to which discrete measurements accurately describe the greater picture which they are intended to represent. Good representativeness is achieved through informed selection of sampling sites and sample aliquots for analyses.

5.4.3 Accuracy and Precision -- the agreement between a measurement and the true value and the degree of variability in this agreement.

5.4.4 Traceability --the extent to which data can be substantiated by hard-copy documentation. Traceability documentation exists in two essential forms; that which links quantitation to certified standards, and that which explicitly describes the history of each sample from collection to analysis.

5.5 QUALITY ASSURANCE OBJECTIVES

Most work completed at Kiber has prescribed quality assurance objectives which are referred to as Data Quality Objectives (DQOs). The data collected is sufficient to evaluate whether the DQOs have been met or not. DQOs are typically addressed in the client scope of work or in the regulations applicable to the particular project. Kiber laboratory testing addresses the relative difference between the untreated and treated waste material for the parameters outlined in the scope of work. Therefore, statistics associated with the change in data are completed routinely

and criteria are based on specific project requirements.

## 6.0 STANDARD OPERATING PROCEDURES FOR SAMPLING AND TESTING

This section summarizes Kiber's sampling capabilities, collection containers, and preservation requirements. Detailed sampling procedures are presented in the sampling SOPs. Kiber maintains current SOP's on all field and treatability sampling procedures. The SOP's content is established based on the requirements set forth by the USEPA Region IV and the State of Florida. Kiber offers sampling services to clients where a Lab Sampling Kit is prepared with all of the necessary pre-preserved containers and documentation. In addition, clients may want to sample themselves. In this situation Kiber can provide a Lab Sampling Kit as well. (See Figure 2)

## 6.1 SAMPLING CAPABILITIES

### 6.1.1 Lab Sampling Kits

### 6.1.2 Soil Sampling

#### 6.1.2.1 Trace Metals

#### 6.1.2.2 Volatile Organics

#### 6.1.2.3 Extractable Organics

#### 6.1.2.4 Inorganics

#### 6.1.2.5 Classics (pH, conductivity, temperature, total dissolved solids)

### 6.1.3 Composite Sampling

#### 6.1.3.1 Timed Composite

#### 6.1.3.2 Flow Proportional Composite

#### 6.1.3.3 Areal Composite

#### 6.1.3.4 Grab Samples

### 6.1.4 Groundwater Sampling (See monitoring well installation log Figure 3 and Schematics Figures 4 & 5)

#### 6.1.4.1 Trace Metals

#### 6.1.4.2 Volatile Organics

#### 6.1.4.3 Extractable Organics

#### 6.1.4.4 Inorganics

#### 6.1.4.5 Classics (pH, conductivity, temperature, total dissolved solids)

### 6.1.5 Drum Sampling (See Figure 6)

### 6.1.6 Surface Sampling

#### 6.1.6.1 wipe sampling

#### 6.1.6.2 chip sampling

- 6.1.6.3 dust sampling
- 6.1.6.4 sweep sampling

## 6.2 SAMPLE CONTAINERIZATION AND PRESERVATION (See Table 1)

- 6.2.1 For traceability purposes, the lot numbers of all precleaned bottles and jars are recorded on the certificate of analysis. The certificate provides the cleaning level of the containers. The certificate is kept on file
- 6.2.2 All chemical preservatives are prepared from ultra-pure grade chemicals and analyte free water. All information concerning manufacturer grade and lot numbers is documented in the field sampling log book kept in the Kiber project file. The date on which any chemical preservative is opened is marked in indelible ink on the outside of the container. Expiration dates are marked on the container with the words "Expiration Date" included. Expiration dates are determined for each individual chemical based on manufacturers' recommendations.

## 6.3 DECONTAMINATION

All sampling equipment is decontaminated before sampling to prevent cross-contamination during sampling. Whenever possible, sufficient quantities of cleaned equipment and sample containers will be transported to the field on a project-specific basis. This is the usual practice to promote sampling efficiency and to eliminate any potential contamination of supplies and equipment. Equipment used for sampling is tagged with the sample location, and is subsequently cleaned in-house under controlled conditions. However, since this is not always possible for some specialized pieces of equipment (i.e., portable power augers), certain field equipment cleaning procedures are required.

## 6.4 SAMPLING EQUIPMENT MATERIALS OF CONSTRUCTION

To avoid possible contamination of samples from the sampling equipment (i.e., trace metals from metal sampling equipment), inert materials of construction will be used whenever possible. All groundwater sampling bailers are constructed of inert materials, i.e. Teflon or stainless-steel. All metal sampling equipment used to obtain solids or liquids will be constructed of stainless steel. This will help prevent possible trace metal contamination (chromium, nickel) that may occur if the sampling equipment becomes scratched during sampling. Disposable sampling equipment will be employed as frequently as possible to prevent contamination. (See Table 2)

## 6.5 QUALITY CONTROL

Collection of field quality control samples includes the following: trip blanks, rinseate blanks, and sample replicates (See Section 11.0).

## 6.6 FIELD TESTING PROCEDURES

- 6.6.1 pH
- 6.6.2 Conductivity
- 6.6.3 Dissolved Oxygen
- 6.6.4 Temperature
- 6.6.5 Flow Measurement

## 7.0 SAMPLE CUSTODY AND DOCUMENTATION

The following activities outline the minimum record keeping requirements as they relate to sample collection, sample handling and sample analyses. The protocols and requirements outlined in this section emphasize the use of accurate and methodical records to document all activities affecting sample data and analyses. Besides these requirements, Kiber may impose higher levels of documentation based on the project background and specific requirements. Procedures are available and followed whenever samples are collected, transferred, stored, analyzed, or destroyed. The primary objective is to create a record that can be used to trace the possession and handling of the sample from the moment of its collection, through analysis, to disposal/return to the client.

## 7.1 GENERAL SAMPLE DOCUMENTATION REQUIREMENTS

- 7.1.1 All of the records are maintained so that tracking and historical reconstruction of all sampling and analytical events can occur. Such records include ancillary procedures produced as the result of the data.
- 7.1.2 All documentation is linked from sampling events, to field testing, to laboratory testing, to sample disposal.
- 7.1.3 All final reports, data summaries and/or other condensed versions of the data are linked to a project by cross-referencing the project specific Kiber project number on each document.
- 7.1.4 All errors recorded in any document are corrected by crossing the error out with a single line dated and initialed. The correct entry is written beside the cross out.
- 7.1.5 All entries are made with black indelible ink.

## 7.2 SAMPLE CUSTODY

### 7.2.1 PROJECT SPECIFIC LOG BOOK

The field book is a bound ledger, with consecutively numbered pages, maintained for a single project. Information concerning all aspects of the sample collection (including documentation of reagent preparation for preservative, etc.) will be recorded in this document.

#### 7.2.1.1 GENERAL FIELD LOG BOOK INFORMATION:

- Purpose of sampling (Kiber project number)
- Project location
- Specific sample location description (reference by station number or benchmark)
- Sample identification number
- Beginning and ending times for timed composite sampling (if applicable)
- Depths at which the sample was collected (if applicable)
- Sample volume
- Chain of custody document number
- Sampling methodology
- Date and time of collection
- Preservative (type and volume added)
- Signatures of sampler and witness
- All pertinent information/observations
- Method of shipment and shipper identification
- Analysis (to be performed)
- Comments/Conditions
- Visitors to site (if applicable)
- Ambient field conditions (if applicable)
- Sample sequence (if applicable)
- Preservation (if applicable)
- Field cleaning documentation (if applicable)
- pH of preserved samples (if applicable)
- Locations of QC samples (if applicable)

#### 7.2.1.2 ADDITIONAL MONITORING WELL LOG BOOK INFORMATION:

- Date and time well purged
- Amount of water purged
- Time elapsed for purge
- Field parameters stabilized (pH, conductivity, etc.)
- Fuel powered units used
- Plumbing tap material (if necessary)
- Flow rate while purging
- Flow rate sampled (500 ml/min.)
- Drilling or boring method and type of drilling mud, if known

#### 7.2.1.3 SOIL BORING SAMPLING LOG (See Boring Record Figure 7, Boring Schematic Figure 8 & Subsurface Drilling Log Figure 9)

#### 7.2.2 SAMPLE LABELS

During sample collection, sample labels (see Figure 10) are attached to each sample container following its collection with the exception of containers used for volatile



soils. Volatile labels are affixed to the container at the time of sample kit preparation since the containers require preweighing. The sample labels contain the following information.

- 7.2.2.1 Individual project number
- 7.2.2.2 Sample identification number
- 7.2.2.3 Time of collection
- 7.2.2.4 Date of collection
- 7.2.2.5 Description of sample(s)
- 7.2.2.6 Name of sampler
- 7.2.2.7 Name of witness

### 7.2.3 CHAIN OF CUSTODY RECORD

Chain of Custody records are completed for all Kiber projects. The requirements for completing the forms are contained in Section 7.4.1. An example of Kiber's Chain of Custody record is presented in Figure 11.

### 7.2.4 CHAIN OF CUSTODY SEALS

Chain of Custody seals are required for Kiber projects in which litigation is involved or any U. S. EPA related projects. An example of a custody seal is presented in Figure 10. All information on seals is completed.

## 7.3 LABORATORY DOCUMENTATION

The following requirements outline the minimum procedures for documentation.

### 7.3.1 RECORDS

- 7.3.1.1 Chain of Custody (See Figure 11)
- 7.3.1.2 Disposal Log- for disposal of samples (See Figures 13 and 14)
- 7.3.1.4 Project Information Form (See Figure 12)

### 7.3.2 ELECTRONIC DATA DOCUMENTATION

- 7.3.2.1 All electronic data reporting are stored under Kiber Project Numbers and are archived on Network archive disks periodically.
- 7.3.2.2 All Electronic Data Files are kept for seven years.

### 7.3.3 DOCUMENTATION OF DATA COLLECTED

All paper from strip chart recorders and related instrumentation are filed with the individual project files.

## 7.4 SAMPLE CUSTODY

Sample custody procedures are practiced from field collection activities, to transport, to laboratory processing, and to disposal or return of samples to the client. By definition, a

sample is in someone's custody if:

- It is in one's possession
- It is in one's view, after being in one's physical possession
- It is in one's physical possession and then stored in a secure facility or location so that no one can tamper with it
- It is kept in a secured area, restricted to authorized personnel only

The following sections outline the custody procedures used at Kiber. All records and documentation denoted in this section are kept on file in respective Kiber project files for easy tracing to specific sampling and analyses events.

#### 7.4.1 OUTLINE OF CHAIN OF CUSTODY - CONSULTING

- 7.4.1.1 After each sample is collected, a label is prepared containing a unique identifier which is the same identifier as that entered on the Chain of Custody (COC) record. (See Figure 11) If required, custody seals are used to seal the container. (See Figure 10)
- 7.4.1.2 The COC is signed upon completion of a sampling project.
- 7.4.1.3 The shipping container, if necessary, is sealed using strapping tape and COC Seals, (see figure 10)
- 7.4.1.4 The COC is signed upon delivery to the analytical laboratory or pickup by the analytical laboratory delivery personnel. A copy is included as permanent project records.

#### 7.4.2 LABORATORY CHAIN OF CUSTODY

##### 7.4.2.1 SAMPLE RECEIPT

- 7.4.2.1.1 Untreated material is received via common carrier (i.e., Federal Express, Airborne).
- 7.4.2.1.2 The COC is signed upon receiving.
- 7.4.2.1.3 Samples are logged into the laboratory tracking system
- 7.4.2.1.4 Sample disposal or return of samples to the client occurs following the applicable time. (See the disposal logs Figures 13 and 14).

##### 7.4.2.2 SENDING SAMPLES FOR (ADDITIONAL) ANALYSES

- 7.4.2.2.1 A new COC is prepared transcribing all applicable information and obtaining the applicable signatures.
- 7.4.2.2.2 A copy is kept on file.
- 7.4.2.2.3 Since treatability samples are unique in that processing occurs at room temperature over several days to several weeks, routine shipment/transport does not occur at 4°C. However, if required by the treatability scope of work, samples are shipped or transported at

4°C.

- 7.4.2.2.4 The original chain of custody is returned to the laboratory with the test results.

## 8.0 INSTRUMENTATION AND LABORATORY PROCEDURES

This section outlines the equipment and procedures used during laboratory and field operations. Details of the procedures are in the Standard Operating Procedures (SOPs) which are written following EPA Region IV, SW-846, and Florida Sampling requirements. See Figures 15 and 16 that outline the project flow for the Treatability laboratory and Field Sampling Activities.

### 8.1 FIELD MONITORING EQUIPMENT (See Table 3 for related equipment)

- 8.1.1 Organic Vapor Analyzer - Flame Ionization Detector (OVA-FID, Foxboro Century Model 128 GC) This equipment is used to screen field soils for organic vapors (i.e., head-space analysis for petroleum contamination). Screening is conducted following EPA region IV and the State of Florida Chapter 17-770, FAC.
- 8.1.2 Oil/Water Interface Probe (Keck)- This equipment is used to measure both the depth to free product and water in monitoring wells; and to measure the thickness of free product in monitoring wells. The instrument is accurate to 0.01 feet.
- 8.1.3 Dissolved Oxygen Meter (Orion)
- 8.1.4 Salinity, Conductivity, Temperature(SCT) Meter (YSI meter)
- 8.1.5 Mercury Vapor Sniffer (Gerome)
- 8.1.6 Water Level Indicator (for wells)
- 8.1.7 Turbidity Meter (HACH)
- 8.1.8 Photoionization Detector (HNU, model 101)
- 8.1.9 Dust/Particulate Personal Monitor (Miniram personal)
- 8.1.10 Drager Pump with Gas Detection Color Tubes -This equipment is used for measuring possible presence of contaminants in the air.
- 8.1.11 Monitox Gas Detector (Compur 4100)- This equipment is used for monitoring hydrogen cyanide and hydrogen sulfide gases.
- 8.1.12 Combustible Gas and Oxygen-Detector (AIM Logic)
- 8.1.13 pH Meter
- 8.1.14 Geiger Counter
- 8.1.15 Oxygen Alarm System

### 8.2 TREATABILITY LABORATORY PROCEDURES

Kiber updates Standard Operating Procedures (SOPs) at least once a year, if necessary. As Kiber adds new capabilities, SOPs are generated and entered into the SOP revision process. The following lists the treatability laboratory SOPs. (See Appendices A for an example of an SOP).

- 8.2.1 Sample Receiving and Storage
- 8.2.2 Temperature Monitoring of Laboratory Ovens

- 8.2.3 Personnel Training
  - 8.2.4 Sample Custody & Documentation
  - 8.2.5 Balance Criteria
  - 8.2.6 Good Laboratory Practice
  - 8.2.7 Freeze/Thaw Durability Testing on Solidified Samples
  - 8.2.8 Specific Gravity Testing
  - 8.2.9 Moisture Content Determination
  - 8.2.10 Photoionization Detector
  - 8.2.11 Moisture-Density Relations
  - 8.2.12 Hydraulic Conductivity of Solidified Samples
  - 8.2.13 Unconfined Compressive Strength of Solidified and Undisturbed Samples
  - 8.2.14 Bulk and Dry Density of Solidified and Undisturbed Samples
  - 8.2.15 Wet/Dry Test on Solidified Samples
  - 8.2.16 Hazscan Drum Testing
  - 8.2.17 Flash Point Check/Determination
  - 8.2.18 Paint Filter Liquids Test
  - 8.2.19 pH-Paper Method-9041A
  - 8.2.20 pH-Soil-9045A
  - 8.2.21 pH-Electrometric-9040
  - 8.2.22 Conductivity
- 8.3 TREATABILITY EQUIPMENT  
See Table 4
- 8.4 WASTE DISPOSAL  
All wastes generated by sampling, decontamination procedures, and/or laboratory procedures are disposed of following all appropriate Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) requirements. Treatment and/or disposal methods for each particular waste stream will follow USEPA treatment standards and approved disposal methods, all of which are specified in 40 and 49 of the Code of Federal Regulations. Segregation, storage, transportation, and disposal of all waste generated on site will take place according to chemical properties and waste streams. Storage of all materials will be in Federal Department of Transportation-approved shipping containers. All materials will be stored on site until proper disposal is arranged. All hazardous materials will be disposed of at RCRA- and CERCLA-approved facilities.
- 8.5 REAGENT WATER  
Water that has been generated by any method which would achieve the performance specifications of ASTM Type II water. (Final Update I SW-846, Third Edition, Volume I, Revision 1, July 1992)
- 8.6 NOTEBOOK GENERATION  
After any custom log is generated, it is copied on numbered pages and bound.

## 9.0 CALIBRATION

This section details the calibration procedures for all field and in-house equipment requiring calibration. These calibration procedures can also be found in the SOP specific to the analysis. See Section 8.2 for a listing of the SOPs. All certificates of analysis accompanying all standard materials and reagents are filed in the Certificate inventory.

## 9.1 FIELD MONITORING EQUIPMENT

All calibrations are performed in the field prior to use. Every calibration is recorded in the project log book. Vapor meters will be calibrated daily with one span gas. If OVAs are used, then carbon filters may be necessary. All field screening analytical instrumentation will utilize continuing calibration standards in addition to the initial calibration curve. These will be run at varying concentrations including low, mid, and high range to assure acceptability of the curve.

### 9.1.1 MERCURY SNIFFER CALIBRATION PROCEDURES

- 9.1.1.1 Put Hg drop and thermometer in calibration thermos.
- 9.1.1.2 Lightly shake thermos and let it sit at stable room temperature (18 - 22°C) preferably for at least two hours; avoid temperature fluctuations of > 1°C per hour.
- 9.1.1.3 Change filter disc and septum.
- 9.1.1.4 Connect septum assembly to intake filter housing and attach zero filter.
- 9.1.1.5 Turn power on.
- 9.1.1.6 Note temperature of calibration vessel.
- 9.1.1.7 Inject 1 cc of Hg vapor.
- 9.1.1.8 Record meter reading.
- 9.1.1.9 Repeat step seven times. If readings are not within  $\pm 5\%$  of each other, repeat them more carefully.
- 9.1.1.10 Refer to calibration table for acceptable range. If average of three injections do not all in acceptable range, heat file and repeat calibration procedure.

### 9.1.2 PHOTOIONIZATION DETECTOR CALIBRATION PROCEDURES

The materials needed are as follows: HNU PID, rotometer, "T" connector, three pieces of 3/8" ID Tygon, Teflon or polypropylene tubing, HNU calibration gas and regulator. If underground storage tank work is performed, the PID must be calibrated against an Organic Vapor Analyzer equipped with a Flame Ionization Detector (OVA-FID).

#### 9.1.2.1 ZEROING

- 9.1.2.1.1 Connect probe
- 9.1.2.1.2 Check battery and allow unit to warm up for 15 minutes on "standby".
- 9.1.2.1.3 Use zero knob to zero the instrument.

#### 9.1.2.2 SET UP

- 9.1.2.2.1 While PID is warming up connect tubing to "T".
- 9.1.2.2.2 Connect rotometer to one piece of tubing and calibration gas to

another piece.

- 9.1.2.2.3 When PID is zeroed, connect probe extension to last piece of tubing.
- 9.1.2.2.4 Note background measurement and record in maintenance log for background corrections.

#### 9.1.2.3 CALIBRATION

- 9.1.2.3.1 Crack valve on regulator until rotometer indicates a slight flow.
- 9.1.2.3.2 Recheck zero.
- 9.1.2.3.3 Switch to "0-200" scale.
- 9.1.2.3.4 Unlock span pot and adjust to ppm value of calibration gas.
- 9.1.2.3.5 Lock span pot.
- 9.1.2.3.6 Switch to "standby" and recheck zero.
- 9.1.2.3.7 If zero must be readjusted, return to step 6.

#### 9.1.3 MONITOX GAS DETECTOR CALIBRATION PROCEDURES

A qualified service technician enhances the intrinsic accuracy of the detector for  $H_2S$  or HCN by using either an  $H_2S$  - nitrogen mixture with definite concentration of  $H_2S$ , or an electronic adjustment is made by means of the Compur current generator U 5900 023 for the  $H_2S$  Monitox or the HCN Monitox. This is performed approximately twice a year.

#### 9.1.4 DISSOLVED OXYGEN METER CALIBRATION PROCEDURES

- 9.1.4.1 Place the instrument in the intended operating position (vertical, tilted, or on its back) before it is prepared for use and calibrated. (Readjustment may be necessary when the instrument operating position is changed.)
- 9.1.4.2 With switch in the OFF position, adjust the meter pointer to Zero with the screw in the center of the meter panel. Re-adjustment may be necessary if the instrument is changed.
- 9.1.4.3 Switch to RED LINE and adjust the RED LINE knob until the meter needle aligns with the red mark at the 31°C position.
- 9.1.4.4 Switch to ZERO and adjust to zero with zero control knob.
- 9.1.4.5 Attach the prepared probe to the PROBE connector of the instrument and adjust the retaining ring finger tight.
- 9.1.4.6 Insert probe into 250 ml flask (with 50 ml water in it), sealing with probe stopper, and swirl. Allow 15 minutes for probe polarization and temperature stabilization.
- 9.1.4.7 Switch to TEMPERATURE and read. Refer to Table I - Solubility of Oxygen in Fresh Water (Tables I and II are on back of meter), and determine calibration value. If water contains Cl - in the part per thousand range, or adjust salinity control (36 ppt for normal sea water).
- 9.1.4.8 Barometric pressure reported by the Weather Bureau is corrected to sea level. In order to use this reported pressure, one must subtract the

pressure drop due to the altitude at the current location. This may be obtained from Table B in the manual. Determine altitude or atmospheric correction factor also using Table B.

- 9.1.4.9 Multiply the calibration value from Table A in the manual by the correction factor from Table B. EXAMPLE: Assume temperature = 21°C and altitude = 1000 feet. From Table A the calibration value for 21°C is 9.0 ppm. From Table B the correction factor for 1000 feet is about 0.96. Therefore, the corrected calibration value is  $9.0 \text{ ppm} \times 0.96 = 8.6 \text{ ppm}$ .
- 9.1.4.10 Switch to the appropriate ppm range, and adjust the CALIBRATE knob until the meter reads the corrected calibration value from Step 4. Wait two minutes to verify calibration stability. Re-adjust if necessary.
- 9.1.4.11 Calibrate against Winkler titration annually.

## 9.1.5 COMBUSTIBLE GAS AND OXYGEN METER CALIBRATION

### 9.1.5.1 COMBUSTIBLE SYSTEM CALIBRATION

- 9.1.5.1.1 Check and zero the instrument.
- 9.1.5.1.2 Attach the flow control to the recommended calibration gas tank.
- 9.1.5.1.3 Connect the adapter-hose to the flow control.
- 9.1.5.1.4 Open flow control valve.
- 9.1.5.1.5 Connect the adapter-hose fitting to the inlet of the instrument. After approximately 15 seconds, the LEL meter pointer should be stable and within the range specified on the calibration sheet accompanying the calibration equipment. If the meter pointer is not in the correct range, stop the flow and remove the right hand side (speaker) panel. Turn on the flow and adjust the "S" control with a small screwdriver to obtain the reading specified on the calibration sheet.
- 9.1.5.1.6 Disconnect the adapter-hose fitting from the instrument.
- 9.1.5.1.7 Close the flow control valve.
- 9.1.5.1.8 Remove the adapter-hose from the flow control.
- 9.1.5.1.9 Remove the flow control from the calibration gas tank.
- 9.1.5.1.10 Replace the side panel on the Model 261.

### 9.1.5.2 OXYGEN ALARM SYSTEM CALIBRATION

- 9.1.5.2.1 Open the instrument lid and turn the center ON-OFF control to the HORN OFF position. Both meter pointers will move and one or both alarms may light.
- 9.1.5.2.2 The % LEL meter pointer should be set to zero by adjusting the ZERO 0 LEL control. Adjustment should be made within 30 seconds after instrument is turned on; this is to prevent accidental activation of the meter latch circuit.

- 9.1.5.2.3 If the % oxygen meter pointer stabilizes at a value other than 20.8%, the pointer should be set to 20.8% by using the CALIBRATE O<sub>2</sub> control.
- 9.1.5.2.4 Press the ALARM RESET button; the alarm(s) should reset and the green pilot light should flash.
- 9.1.5.2.5 Momentarily place a finger over the sample inlet fitting or the end of the sample line probe. Observe that the flow indicator float drops out of sight, indicating no flow. If the float does not drop, check the flow system for leaks.
- 9.1.5.2.6 Press the CHECK button and observe the % LEL meter. The pointer must read 80% LEL or higher as marked by the BATTERY zone on the meter. If the pointer reading is less, the battery pack must be recharged; no tests should be attempted as the instrument will malfunction.
- 9.1.5.2.7 Turn the ON-OFF control to the ON position. The pilot lamp should light continuously.
- 9.1.5.2.8 Accessory equipment such as sampling lines, probes, carrying harness, filters or line traps should be attached as required. Tighten all connections and test for flow indication by blocking flow at the far end of the sampling system. If the flow indicator float does not drop, check all connections and test again. If the float still does not drop, refer to manufacturers instructions for further information.

9.1.6 DUST/PARTICULATE MONITOR CALIBRATION PROCEDURE (when changing the calibration constant)

(Charge independently from the Mini-Ram by plugging the charger into the charge receptacle which is an integral part of the battery pack.) Such a calibration should be performed by obtaining a concurrent filter collection (e.g., by means of a personal filter sampler), sampling from the same environment within which the Mini-Ram is placed. The average concentration obtained by the Mini-Ram (i.e., TWA reading) at the end of the test should be compared with the filter-gravimetric-determined concentration. The ratio of the two concentration values can then be used to correct the Mini-Ram calibration. The comparison run should be replicated several times (to minimize errors) to obtain an average ratio.

- 9.1.6.1 Place Mini-Ram in a clean environment (e.g., air conditioned office).
- 9.1.6.2 Remove battery pack.
- 9.1.6.3 Disconnect battery connector (remember that all stored data will thus be lost/erased from Mini-Ram memory).
- 9.1.6.4 While leaving battery pack lying next to Mini-Ram, reconnect the two units (i.e., plug in connector).
- 9.1.6.5 Immediately observe Mini-Ram display. It will be performing a slow segment-by-segment display checkout. As soon as it displays ".00", press OFF, thus interrupting the initial automatic zero check. Wait until the



display indicates OFF and then press MEAS and wait approximately 36 seconds.

- 9.1.6.6 Observe 10-second readings (typically in the range of 1 to 3 mg/m<sup>3</sup>) and record manually a few consecutive readings. Calculate the average of these values.
  - 9.1.6.7 Identify small potentiometer screw (visible through an opening in the foil shield of the open Mini-Ram opposite the digital output jack. Adjust this potentiometer using a fine screwdriver until the average Mini-Ram reading is increased or decreased (with respect to the average) by the desired ratio (e.g., as determined by previous gravimetric comparison runs).
  - 9.1.6.8 Shut off Mini-Ram, reposition and secure battery pack, and re-zero instrument as usual. All subsequent concentration readings are now corrected by the desired ratio.
- 9.1.7 TURBIDITY METER CALIBRATION  
Calibration of the turbidity meter is performed before each use with gel standards within the expected range of the samples. The turbidity meter is annually calibrated using standards prepared from formazine or when the secondary calibration standards are not within  $\pm 5\%$  of their calibrated value. See the manufacturer's calibration instructions.
- 9.1.8 SALINITY, CONDUCTIVITY, TEMPERATURE (SCT) METER CALIBRATION PROCEDURE  
Kiber uses a YSI S-C-T Meter, calibrated to 1.5% based on a standard solution. The salinity, conductivity, temperature meter is calibrated daily or prior to each use with one potassium chloride standard in the expected range of the sample.
- 9.1.8.1 Turn the MODE control to REDLINE
  - 9.1.8.2 Adjust the REDLINE control so the meter needle lines up with the redline on the meter face. (If this cannot be accomplished, replace the batteries.)
  - 9.1.8.3 The temperature probe is calibrated against a field-grade thermometer, which is calibrated against a NIST-traceable thermometer.
  - 9.1.8.4 A secondary conductance calibration KCl standard is analyzed near the sample conductance while compensating for temperature for every ten samples. The results are recorded in project log book.

## 9.2 GENERAL LABORATORY EQUIPMENT

### 9.2.1 pH METER: GENERAL CALIBRATION PROCEDURES (See appropriate SOP for daily procedures)

#### Set-up

- 9.2.1.1 Adjusters -- Add ionic strength adjustors (ISAs), pH adjustors, or decomplexing agents (adjustors) in the same proportions to all samples, standards, and the blank.

9.2.1.2 Standards -- Prepare 2 standards in the range of expected sample concentrations. Label one standard A, 7 pH and the other B, pH 4.0 or 10.0.

9.2.1.3 Blank -- Add adjustors to distilled or deionized water in the same proportion as added to all samples.

#### Calibration

9.2.1.4 Calibrate daily or before each use.

9.2.1.5 Set up the 901 electrodes.

9.2.1.6 Turn slope thumbwheel switches to read the slope found in the daily electrode check (from electrode instruction manual).

9.2.1.7 Set the sign to minus (anions or ammonia electrodes) or plus (cations, carbon dioxide, or nitrogen oxide electrodes).

9.2.1.8 Turn STD thumbwheel switches to read the concentration of standard A. Any concentration units may be used. Set mode switch to CONCN. If SET BLANK is lighted, press button to turn off.

#### Blank Correction (for low-level measurements)

9.2.1.9 Place electrodes in distilled water that is mixed with adjustors blank.

9.2.1.10 Allow time for reading to stabilize.

9.2.1.11 Press SET BLANK button. The button light will come on.

#### Slope (optional procedure for higher precision)

9.2.1.10 Place electrodes in standard B.

9.2.1.11 Add adjustors.

9.2.1.12 Allow time for reading to stabilize.

9.2.1.13 Slowly adjust the slope thumbwheel switches until display reads the exact concentration of standard B.

#### Measurements

9.2.1.14 Rinse electrodes, blot dry, and place in sample.

9.2.1.15 Add any adjustors needed.

9.2.1.16 Allow time for reading to stabilize.

9.2.1.17 Record sample concentration from the display.

9.2.1.18 Repeat above measurement steps for subsequent concentration measurements. (Do not press CLEAR/READ MV.)

9.2.1.19 Recalibrate every two to three hours. If sample temperature has not changed, repeat only set standard. If temperature has changed, increase the magnitude of the SLOPE setting by 1 MV (monovalent ions or dissolved gases), or 0.5 mV (divalent ions) per 5°C increase temperature.

### 9.2.2 ANALYTICAL BALANCE

9.2.2.1 Allow balance to stabilize by leaving power supply on for one hour.

9.2.2.2 Remove objects from the pan and close doors.

9.2.2.3 Press control bar until "CAL---" is displayed.

9.2.2.4 Release control bar, "CAL---" appears on display.

9.2.2.5 Slide calibration lever slowly towards the rear when "CAL 100" is displayed.

- 9.2.2.6 "CAL--" will be displayed, then "100.0000"; at this time, the balance has been calibrated to  $100.0000 \text{ g} \pm 0.0002 \text{ g}$ .
- 9.2.2.7 "CAL 0" will next appear - slide calibration lever back to original position - "----" will be displayed, then "0.0000"; at this time the balance has been zeroed to  $0.0000 \text{ g} \pm 0.002 \text{ g}$ .
- 9.2.2.8 The calibration of each analytical balance is checked prior to use or daily using Class S1 weights. The balance will be serviced and calibrated annually by a certified technician.

#### 9.2.3 THERMOMETER CALIBRATION

Glass thermometers are calibrated annually and electronic thermometers are calibrated quarterly.

- 9.2.3.1 Place NIST-traceable thermometer and thermometer to be calibrated in the same water or ice bath.
- 9.2.3.2 Record readings on both thermometers in the calibration thermometer book (See Figure 17)
- 9.2.3.3 Print a thermometer tag which includes the date calibrated, thermometer number, initials of quality control clerk, and the degree deviations from that reading recorded for the NIST-traceable thermometer.

#### 9.2.4 PIPET CALIBRATION

Pipets (adjustable - Eppendorf type) are calibrated quarterly, if routinely used.

- 9.2.4.1 Calibrate Analytical Balance (see Section 9.2.2)
- 9.2.4.2 Place weigh boat on balance.
- 9.2.4.3 Pipet volume of room temperature water and weigh.
- 9.2.4.4 Record the volume setting of the pipet and the weight. (See Figure 18)
- 9.2.4.5 Record the % recovery assuming the 1 gram = 1 ml of water.

### 9.3 TREATABILITY INSTRUMENTATION: GENERAL CALIBRATION INSTRUCTIONS

#### 9.3.1 UNCONFINED COMPRESSIVE STRENGTH

Service by a trained representative.

#### 9.3.2 PERMEABILITY TESTING

Service by a trained representative.

### 9.4 STANDARDS TRACEABILITY

All Calibration standards are traceable to the National Institute of Standards and Testing (NIST) or EPA whenever such standards are available. Commercial sources of standards and reagents are purchased with the certification of analysis which document the standard / reagent purity.

### 9.6 STANDARD PREPARATION FREQUENCY

See Table 5

## 10.0 PREVENTIVE MAINTENANCE

Proper maintenance is critical to the performance and minimization of downtime of all equipment whether it is for measurement or support. Preventive maintenance will be completed as recommended by the manufacturer of the respective equipment. Tables 6 and 7 list the minimum preventive maintenance procedures conducted at Kiber.

### 10.1 DOCUMENTATION

All routine maintenance and major repairs completed on field screening or laboratory equipment is recorded in a bound logbook.

### 10.2 CONTINGENCIES FOR DOWNTIME

All samples processed prior to a system failure will be evaluated for acceptability. Any unacceptable samples will be reprocessed when the system failure is corrected. The following outlines procedures taken to minimize down time effects:

10.2.1 Spare parts are available, ie. fuses, printed circuit boards, and cables

10.2.2 A service engineer is available

10.2.3 Vendor service agreements are available and may be established to respond within 24 hours

10.2.4 Subcontract laboratories are available that have been approved by Kiber and/or maintain a current certification applicable to the work at hand, i.e., United States Army Corps of Engineers (USACE) or Florida, etc. (Figure 19 provides a request form that will accompany samples and COC to the subcontract laboratory.)

### 10.3 CONTROLLED STORAGE UNITS

Temperatures for refrigerators, ovens, and controlled rooms are recorded in bound notebooks.

## 11.0 QC: QC SAMPLES, PRECISION, ACCURACY, AND METHOD DETECTION LIMITS

Kiber's QA program is designed to assure that the data generated is comparable, accurate, reproducible, valid and defensible. The program is not restricted to laboratory data, but is also designed to safeguard all aspects of sampling. In cases where sample difficulty requires a deviation from routine protocol, the client is contacted which is documented on a call log.

### 11.1 FIELD QUALITY CONTROL CHECKS

All field QC samples are completed at a frequency of 5%.

#### 11.1.1 FIELD BLANKS

The analytical data derived from field blanks is used to assess that the field sampling operations were carried out in an analyte free environment. Blanks provide information about the following potential sources of contamination: sample containers, preserving reagents, sampling equipment, site contamination, sample

storage, and transport. Blanks are treated exactly as a sample during field activities (preserved with the same reagents, stored and transported in the same containers as the samples, etc.). Specific projects will state the quality controls necessary to address specific DQOs. The following defines the types and frequencies of field blanks that can be completed.

Organic-Free Reagent Water: Water in which an interferant is not observed at the method detection limit of the compounds of interest. (Final Update I SW-846, Third Edition, Volume I, Revision 1, July 1992)

#### 11.1.1.1 Equipment (or Rinsate) Blanks

A sample of analyte-free media which has been used to rinse the sampling equipment. It is collected after completion of decontamination and prior to sampling. This blank is useful in documenting adequate decontamination of sampling equipment. (Final Update I SW-846, Third Edition, Volume I, Revision 1, July 1992)

At least one equipment blank is prepared for each piece of sampling equipment used. Equipment blanks are prepared wherever the equipment is cleaned, (ie. in the field or during field preparation procedures at the laboratory) unless the equipment is used/cleaned repetitively for at least 20 times at one sampling event. In this case, the equipment blank is collected at a rate of 5%. (Note: the water used for volatile sampling equipment blanks is from the same source as the trip blank water.)

#### 11.1.1.2 Trip Blanks

A sample of analyte-free media taken from the laboratory to the sampling site and returned to the laboratory unopened. A trip blank is used to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organics samples. (Final Update I SW-846, Third Edition, Volume I, Revision 1, July 1992)

Trip blanks are prepared for each volatile sampling event. Trip blanks can be prepared for other specified analyses as well. (Note: the same water source used for trip blanks is to be used for the sampling equipment blanks.)

#### 11.1.2 FIELD DUPLICATES

Duplicates are typically a measure of the precision of the sampling technique plus the analytical laboratory completing the analyses.

Precision: The agreement among a set of replicate measurements without assumption of knowledge of the true value. Precision is estimated by means of duplicate/replicate analyses. These samples should contain concentrations of analyte above the MDL, and may involve the use of matrix spikes. The most commonly used estimates of precision are the relative standard deviation (RSD) or the relative percent difference (RPD) when two samples are available. (Final Update I SW-846, Third Edition, Volume I, Revision 1, July 1992)

Duplicate samples are treated exactly as a sample during field activities (preserved with the same reagents, stored and transported in the same containers as the samples, etc.). Specific projects will state the quality controls necessary to address specific DQOs. The following defines the types and frequencies of field duplicates that can be completed.

#### 11.1.2.1 Field Duplicates for Laboratory Analysis

Independent samples which are collected as close as possible to the same point in space and time. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently. These duplicates are useful in documenting the precision of the sampling process. (Final Update I SW-846, Third Edition, Volume I, Revision 1, July 1992)

At least one sample or 10% of the samples, whichever is greater, will be collected for each analytical parameter and analyzed as field duplicates.

#### 11.1.2.2 Field Analysis Duplicates

A duplicate measurement of the field analysis, ie. pH. At least one sample or 10% of the samples, whichever is greater, will be analyzed as duplicates.

### 11.2 ANALYTICAL LABORATORY QUALITY CONTROL REQUIREMENTS

The QC analysis completed is in compliance with that required in the applicable method. Kiber requires that QC samples are to be treated exactly as a sample during laboratory activities. Specific projects will state the quality controls necessary to address specific DQOs. Specific client QC requests presented prior to project initiation or prior to a specific sampling event will be accommodated by Kiber. Kiber requires that all QC must meet laboratory established performance criteria, where applicable. In cases where performance criteria are not met, Kiber requires further evaluation, ie. reanalysis to confirm matrix interference. The following defines the types and frequencies of QC samples Kiber requires to be completed. Although Kiber requires the QC samples to be completed, reporting of such QC samples may occur only at the specific request at the time of sample delivery or pick-up. See Table 8 for Common QA/QC Samples, Procedures and Preparations.

#### 11.2.1 SPLIT SAMPLES (DUPLICATES OR REPLICATES)

Aliquots of sample taken from the same container and analyzed independently. In cases where aliquots of samples are impossible to obtain, field duplicate samples should be taken for the matrix duplicate analysis. These are usually taken after mixing or compositing and are used to document intra- or interlaboratory precision. (Final Update I SW-846, Third Edition, Volume I, Revision 1, July 1992)

Kiber requires split samples to be completed at a 20% frequency.

#### 11.2.2 BLANK SPIKE-BS (LABORATORY CONTROL SAMPLES - LCS)

A known matrix spiked with compound(s) representative of the target analytes. This is used to document laboratory performance. (Final Update I SW-846, Third Edition, Volume I, Revision 1, July 1992)

Kiber requires blank spike samples to be completed at a 20% frequency.

#### 11.2.3 MATRIX SPIKE (MS)

An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix. (Final Update I SW-846, Third Edition, Volume I, Revision 1, July 1992)

Kiber requires matrix spike samples to be completed at a 20% frequency.

#### 11.2.4 MATRIX SPIKE DUPLICATE (MSD)

Intra laboratory split samples spiked with identical concentrations of target analyte(s). The spiking occurs prior to sample preparation and analysis. They are used to document the precision and bias of a method in a given sample matrix. (Final Update I SW-846, Third Edition, Volume I, Revision 1, July 1992)

Kiber requires matrix spike duplicate samples to be completed at a 20% frequency.

#### 11.2.5 SURROGATES

An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. (Final Update I SW-846, Third Edition, Volume I, Revision 1, July 1992)

All organic analyses use surrogates.

#### 11.2.6 CALIBRATIONS

Instruments are calibrated and verified at regular intervals. Kiber requires the laboratory to maintain records of all calibrations, verifications and vendor maintenance. All calibrations are required to be traceable to primary standards and certificates are required to be filed for reference. Other measurement devices, such as balances and thermometers, are required to be calibrated against certified sources. Documentation of calibration verifications is required to be maintained at the laboratory bench if documented frequently or with the QA/QC officer.

#### 11.2.7 METHOD BLANKS

The analytical data derived from method blanks are required to be used to assess that the laboratory processes were carried out without introducing analytes into samples. Blanks provide information about the following potential sources of contamination: glassware, reagents, standards, personnel or sample preparation environment. Blanks are required to be treated exactly as a sample during laboratory activities (sample

extractions through analysis and data reporting). The following defines a method blank.

An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination resulting from the analytical process. (Final Update I SW-846, Third Edition, Volume I, Revision I, July 1992)

A method blank is required to be prepared each day a laboratory procedure is completed except wet chemistry. A method blank is required for the applicable wet chemistry procedures. Various routine QC checks are also required to be in place to verify that new lots of glassware, sample storage areas (including refrigerators), and water purification systems are contaminant-free.

#### 11.2.8 STANDARDS

All Calibration standards are required to have a certificate of analysis. Each lot number of standards and reagents are required to be checked for purity. The required approval process consists of comparing the instrument response to the response obtained from the previous standard. If no contamination is apparent, the standards are approved for use. Corrective action is required for lot numbers that are unable to be approved. Working standards are required to be prepared when necessary or as stated in the laboratory's SOP.

#### 11.2.9 PERFORMANCE EVALUATION STANDARDS

Blind and Double-Blind evaluations are required to be completed (i.e., ERA, WP, WS, or State/Agency evaluation samples)

#### 11.2.10 PRECISION AND ACCURACY

Kiber requires all analytical analysts to have documented precision and accuracy results. Such analyses consist of four replicates at a predetermined concentration. The required calculations are based on those outlined in SW-846.

### 11.3 ANALYTICAL QC CALCULATIONS

#### 11.3.1 PRECISION

The objective is to equal or exceed the precision data generated by the applicable method on similar matrices. In routine analyses, the values for most parameters are usually below practical quantitation limits (PQLs); therefore, precision data are derived from duplicate matrix spike results. Relative percent difference (RPD) is used to calculate precision between a pair of numbers.



---

$$RPD = \frac{|A-B|}{A+B} \times 200$$

Where: A = concentration in sample A  
B = concentration in sample B

---

### 11.3.2 ACCURACY

The objective is to equal or exceed the accuracy data generated by the applicable method on similar matrices. Percent recovery (%R) is used to express accuracy from the analysis of matrix spikes, blank spikes, surrogates, and other QC samples. The accuracy of a measurement will be determined by the recovery of a known amount of analyte in a real sample (%R).

---

$$\%R = \frac{C_s - C_u}{S} \times 100$$

Where:  $C_s$  = concentration of spiked sample  
 $C_u$  = concentration of unspiked sample  
S = expected concentration of spike in sample  
%R = percent recovery

---

## 11.4 REPORTING LIMITS

### 11.4.1 METHOD DETECTION LIMIT (MDL)

Kiber requires that MDL studies be completed annually. The required MDL procedure is outlined in the 40 CFR Part 136, "Definition and Procedure for the Determination of the Method Detection Limit - Revision 1.11". This method requires seven replicates of a standard at or near the MDL. The seven replicates are required to be processed through all steps to mimic that of a sample, including extractions. The resulting concentrations are required to be multiplied by the applicable calculation factors including initial and final volumes and weights. The standard deviation is calculated from the seven final values and then multiplied by three. Kiber requires that the initial concentration of the standard used to determine MDLs be checked for the appropriate value per 40 CFR part 36.

### 11.4.2 PRACTICAL QUANTITATION LIMIT

Otherwise known as reporting limit. Kiber requires that a low standard be

analyzed at or below the reporting limit. This standard can be a calibration standard (i.e. part of the curve) or a standard that meets 75 - 125% recovery.

## 12.0 DATA REDUCTION, VALIDATION AND REPORTING

Data reduction, validation, and reporting are performed using different procedures based on the procedure performed.

### 12.1 FIELD PROCEDURES

Table 9 lists all direct reading field instruments currently used by Kiber and the reporting parameters of the instrument. The on-site technician/chemist will be trained to use the procedures. Such procedures may be performed by the site health and safety officer.

#### 12.1.1 DATA REDUCTION

All raw data collected from the instruments are recorded in a project and health and safety log book if applicable. Units are converted to apply to the particular project.

TABLE 9  
 DIRECT READING FIELD INSTRUMENTS

INSTRUMENT	READING
Explosimeter/Combustible Gas Meter	% O <sub>2</sub> / % LEL
Monitox Gas Detector	> 10 ppm HCN or H <sub>2</sub> S
Mini-Ram Personal Monitor	mg/cm <sup>3</sup>
Dissolved O <sub>2</sub> Meter*	ppm
Drager Tube Vapor Detector	ppm
Water level Indicator	feet
OVA-FID	ppm
PID	ppm
Analytical Balance	mg
Thermometer	°C
Setaflash	°F
Conductivity Meter	umhos
Geiger Counter	Counts
Oil/Water Interface Probe	feet
Mercury Vapor Sniffer	units
Turbidity Meter	NTU
pH Meter	Standard Units

\* Kiber uses a dissolved oxygen meter and pH meter in which the temperature compensation is automatically dialed in.

#### 12.1.2 DATA VALIDATION

Where applicable, all field data are evaluated against the project DQOs to ensure that the issues were adequately addressed during measurements.

### 12.1.3 DATA REPORTING

All evaluations pertinent to the project are included in the project presentation at the conclusion of the study.

## 12.2 ANALYTICAL DATA REVIEW REQUIREMENTS

The data review process is required to consist of the following levels of review targeting different aspects of the data.

### 12.2.1 Level I - Sample Preparation Review

All logs completed in sample preparations are required to be reviewed, initialed and dated by a second chemist.

### 12.2.2 Level II - Analyst Review

The following outlines the required responsibilities of the analyst completing the analysis:

- 
- o Correct analyte identification
  - o Initial/Daily Calibration acceptable
  - o QC samples are within established limits
  - o Correct analyte quantitation
  - o Documentation is complete: standards logs, run logs, batch logs
  - o Assurance that carry over was not a problem during sample analysis
- 

### 12.2.3 Level III - QC Review

The following outlines the required responsibilities of the applicable personnel:

- 
- o Verifies Login with client COC
  - o Verifies sample preparation log information is complete, in compliance, and legible
  - o Verifies that instrument performance is in compliance
  - o Verifies analysis information is complete, in compliance, and legible
  - o Analytical results are verifiable
  - o QC samples are within appropriate QC limits or proper corrective action steps taken
  - o Documentation is complete: run log, batch log, checklists, etc.
- 

#### 12.2.4 Level IV - Final Report Review

The following outlines the required responsibilities of the applicable personnel:

- 
- o Verifies that the hits reported are hits on raw data
  - o Verifies the calculations of hits
  - o Verifies that header information is complete
  - o Verifies units
  - o Verifies client specific requests are met
- 

### 12.3 TREATABILITY LABORATORY PROCEDURES

#### 12.3.1 DATA REDUCTION

Data is collected from analytical, physical property, and geotechnical testing and presented in a summary table. All units will be changed and/or calculations made.

#### 12.3.2 DATA VALIDATION

Data is reviewed for accuracy of data entry and for predictable and unpredictable trends from the beginning to current stages of applied treatabilities. Such trends will involve the use of statistics. This evaluation will include a selection of one or many treatment processes depending on the stage of treatment.

#### 12.3.3 DATA REPORTING

Data reporting may include generation of periodic summary tables during treatment. The final report will include completed summary tables of all data

collected during projects. Analytical reports may be presented as an attachment to the body of the final project.

### 13.0 CORRECTIVE ACTION

Table 10 summarizes examples of corrective action completed for laboratory measurements.

TABLE 10  
EXAMPLES OF STANDARD LABORATORY CORRECTIVE ACTION

PROCESS AFFECTED	CORRECTIVE ACTION
Instrument Calibration	Re-analyze Standards. If still unacceptable, then remake standards. Check against external reference as necessary.
Calibration Blank	Prep and re-analyze another blank, if the same response is obtained, determine the cause, check for contamination, failed standard response, reagents, verify instrument performance.
Duplicate Samples	Re-analyze both duplicate samples. If necessary, re-prepare sample batch.
Reagent Water System	Call for Service from vendor.
Incorrect reagent received	Call vendor to determine return procedures and reorder appropriate reagent.

### 14.0 PERFORMANCE AND SYSTEM AUDITS

Audits are completed on all activities and documentation related to laboratory and field activities. The audit activity may address specific projects or the effectiveness of a system. The result of an audit may be to improve, abolish, or create a system. The audit process provides a documented level of assurance of company performance.

#### 14.1 PROCEDURE AUDITS

Audits that evaluate the compliance of SOPs with regulation are procedure audits. Such audits are completed for each procedure at Kiber.

#### 14.2 PERFORMANCE AUDITS

Audits that evaluate the compliance of laboratory or field performance against an SOP are performance audits. Such audits are randomly completed and may be performed as a follow-up to training. Performance includes techniques that may not be explicitly stated in the SOPs or regulations.

14.3 ANALYTICAL LABORATORY PERFORMANCE

Blind and Double-Blind evaluations are required to be completed (i.e., ERA, WP, WS, or State/Agency evaluation samples) - see section 11.2.9.

14.4 HEALTH AND SAFETY AUDITS

Safety and Housekeeping Checklist is routinely completed (See Figure 20).

15.0 QUALITY ASSURANCE REPORTS

When applicable, reports are submitted to the President. Such reports may include the following:

- 15.1 Table of Contents
- 15.2 Introduction
- 15.3 What is New for the Quarter?
- 15.4 Procedural Development
- 15.5 Training
- 15.6 Analytical Performance Evaluation
- 15.7 Performance Evaluation Programs - Internal
- 15.8 Data Reporting
- 15.9 Corrective Actions
- 15.10 Internal Audits
- 15.11 External Audits
- 15.12 Analytical Sub-Contractor Audits
- 15.13 Conclusion

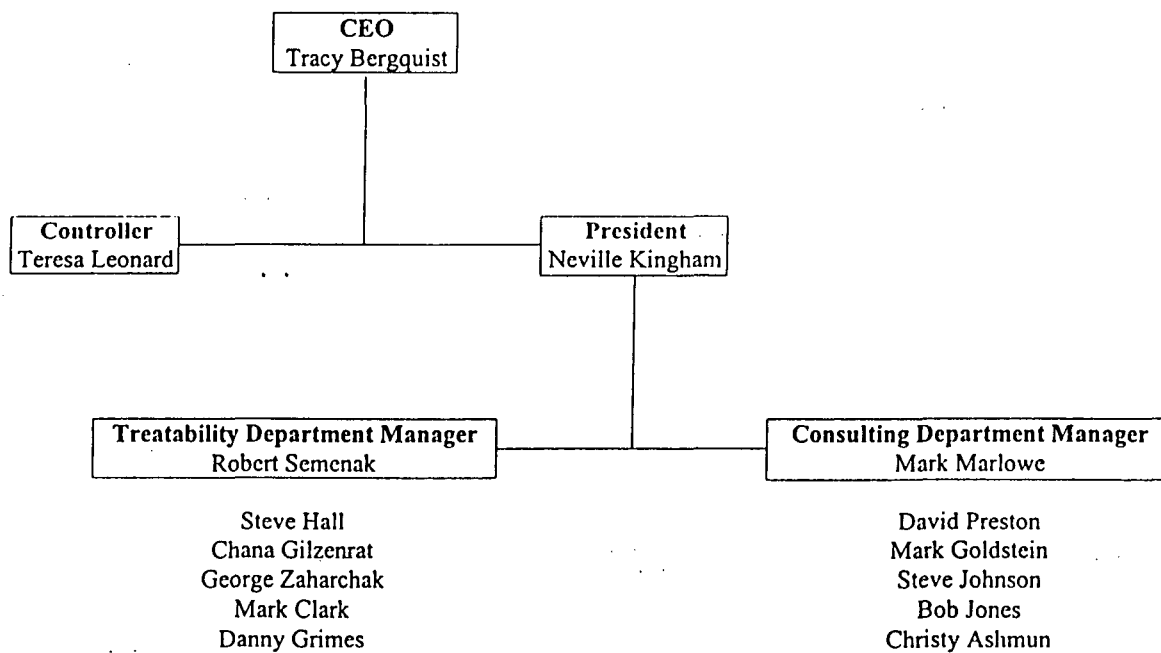
16.0 RESUMES

See Appendix B for resumes of key personnel.

KIBER ENVIRONMENTAL SERVICES, INC.

Figure 1

ORGANIZATIONAL CHART



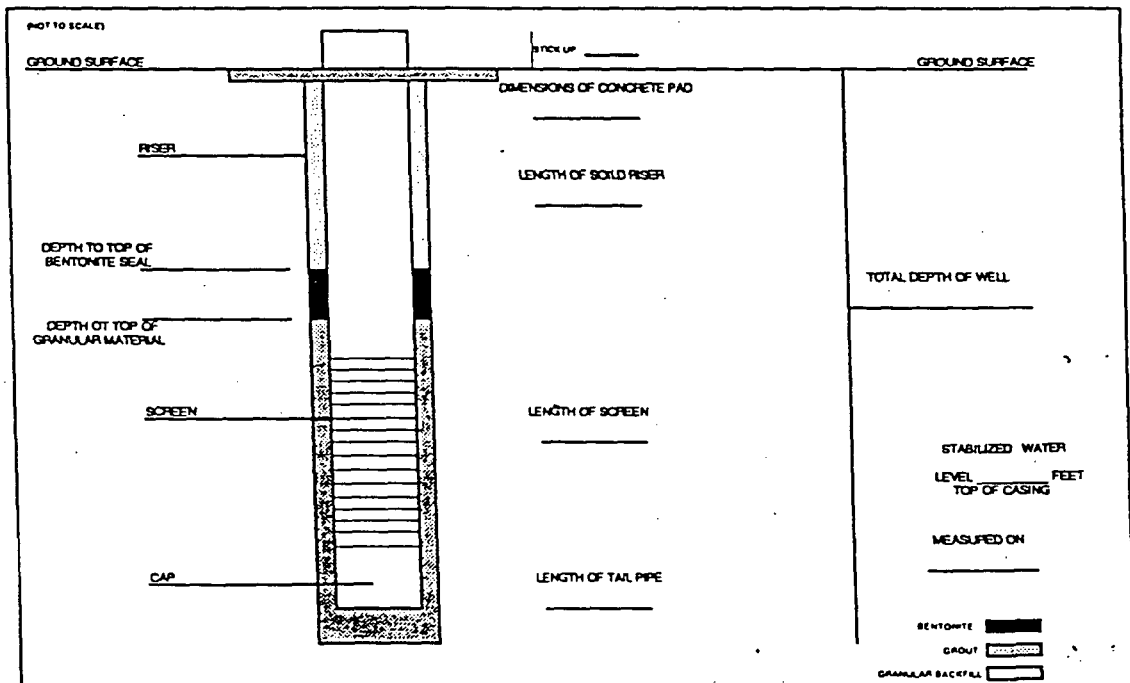
## ANALYTICAL REQUEST and SAMPLE KIT TRACKING FORM

[illegible]




TYPE II MONITORING WELL INSTALLATION DIAGRAM		
<b>KIBER ENVIRONMENTAL ATLANTA, GEORGIA</b>	<b>JOB NAME</b> _____ <b>WELL NO.</b> _____ <b>DATE</b> _____ <b>WELL LOCATION</b> _____	<b>JOB NO.</b> _____ <b>TIME</b> _____

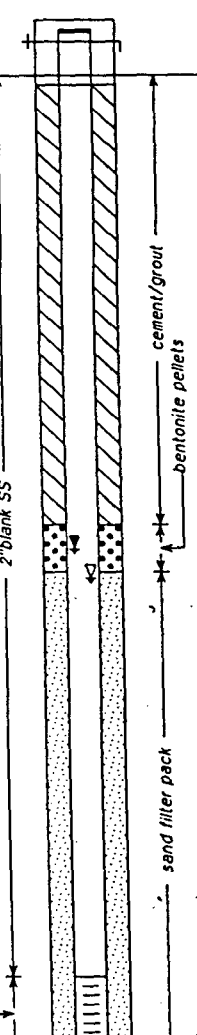
<b>GROUND SURFACE ELEVATION</b> _____ <b>TOP OF SCREEN ELEVATION</b> _____ <b>REFERENCE POINT ELEVATION</b> _____ <b>TYPE SAND PACK</b> _____ <b>GRADATION</b> _____ <b>SAND PACK MANUFACTURER</b> _____ <b>SCREEN MATERIAL</b> _____ <b>MANUFACTURER</b> _____ <b>RISER MATERIAL</b> _____ <b>MANUFACTURER</b> _____ <b>RISER DIAMETER</b> _____ <b>SCREEN DIAMETER</b> _____ <b>SLOT SIZE</b> _____ <b>DRILLING TECHNIQUE</b> _____ <b>AUGER SIZE AND TYPE</b> _____	<b>BENTONITE TYPE</b> _____ <b>MANUFACTURER</b> _____ <b>CEMENT TYPE</b> _____ <b>MANUFACTURER</b> _____ <b>BOREHOLE DIAMETER</b> _____ <b>KIBER ASSOCIATES, INC.</b> <b>FIELD REPRESENTATIVE</b> _____ <b>DRILLING CONTRACTOR</b> _____ <b>AMOUNT BENTONITE USED</b> _____ <b>AMOUNT CEMENT USED</b> _____ <b>AMOUNT SAND USED</b> _____ <b>STATIC WATER LEVEL</b> <b>(AFTER DEVELOPMENT)</b> _____
---	--



<b>QA/QC</b>	<b>INSTALLED BY:</b> _____ <b>INSTALLATION OBSERVED BY:</b> _____ <b>DISCREPANCIES:</b> _____
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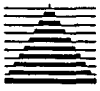
 <b>KIBER</b> ENVIRONMENTAL SERVICES, INC.		SUBSURFACE DRILL LOG			<b>MW-6</b> Page 1 of 1	
PROJECT:				LOCATION: <i>Greenville, Georgia</i>		
DATE DRILLED: <i>3/30/95 - 3/30/95</i>				SURFACE ELEVATION: <i>820.42 Feet MSLD</i>		
DRILLING METHOD: <i>6.25 in Hollow Stem Auger</i>				TOTAL DEPTH: <i>52 Feet</i>		
DRILLING COMPANY: <i>Kilman Brothers</i>				GEOLOGIST: <i>Jack Wittle</i>		

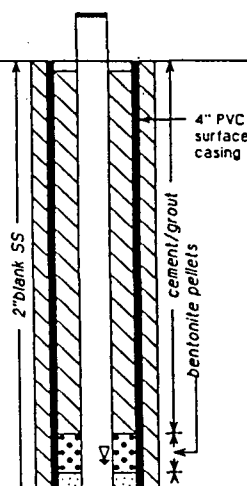
  

DEPTH (feet)	SAMPLE INTERVAL	SAMPLE NUMBER	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	WELL DIAGRAM
5	☒	SS-1	11			RESIDUAL: Red brown clayey SILT	
10	☒	SS-2	8				
15	☒	SS-3	10			Red brown slightly sandy clayey SILT	
20	☒	SS-4	8			SAPROLITE: Orange brown slightly sandy clayey micaceous SILT	
25	☒	SS-5	6				
30	☒	SS-6	3			Mottled orange brown clayey very micaceous SILT	
35	☒	SS-7	4				
40	☒	SS-8	4			Mottled orange yellow brown clayey very micaceous SILT	
45	☒	SS-9	9			Brown yellow clayey very micaceous SILT	
50	☒	SS-10	24				

JOB NUMBER: 1226

102039

 <b>KIBER</b> ENVIRONMENTAL SERVICES, INC.		<b>SUBSURFACE DRILL LOG</b>			<b>MW-4BR</b> Page 1 of 2	
PROJECT:				LOCATION:		
DATE DRILLED: 3/30/95 - 3/30/95				SURFACE ELEVATION: 789.8 Feet MSLD		
DRILLING METHOD: 6.25 in Hollow Stem Auger				TOTAL DEPTH: 52 Feet		
DRILLING COMPANY:				GEOLOGIST:		

DEPTH (feet)	SAMPLE INTERVAL	SAMPLE NUMBER	BLOWS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	WELL DIAGRAM
5  10  15  20	SS-1	16		[Symbol]		RESIDUUM, Red brown silty CLAY	 <p>4" PVC surface casing            cement/grout            bentonite pellets            2" blank SS</p>
	SS-2	11		[Symbol]		SAPROLITE: Orange gray slightly sandy clayey SILT	
	SS-3	48		[Symbol]		Mottled white black, yellow slightly sandy clayey SILT	
	SS-4	50/2"		[Symbol]		Mottled white black, yellow slightly sandy clayey SILT	
25  30  35  40  45  50				[Symbol]		PARTIALLY WEATHERED ROCK: Brown Gray biotite gneiss	
Auger Refusal @ 22 feet. BEGAN CORING AT 22 FEET.							

DRUM INVENTORY LOG		DRUM NO _____ DRUM LOCATION _____	
PROJECT LOCATION _____		PROJECT # _____ DATE _____	
PROJECT CONTACT _____		SAMPLER _____ TIME _____	
CLIENT _____		CLIENT CONTACT _____ WEATHER _____	
DRUM TYPE:      Fiber <input type="radio"/> Steel <input type="radio"/> Poly <input type="radio"/> Stainless Steel <input type="radio"/> Nickel <input type="radio"/> Other <input type="radio"/>			
DRUM CONDITION    DOT Shippable <input type="radio"/> Good <input type="radio"/> Fair <input type="radio"/> Poor <input type="radio"/>			
DRUM ACCESS:      Open Top <input type="radio"/> Closed Top <input type="radio"/>			
DRUM OVERPACK SIZE: <input type="radio"/> 10 <input type="radio"/> 30 <input type="radio"/> 55 <input type="radio"/> 85 <input type="radio"/> 110			
ORIGINAL DRUM SIZE: <input type="radio"/> 5 <input type="radio"/> 10 <input type="radio"/> 15 <input type="radio"/> 30 <input type="radio"/> 42			
<input type="radio"/> 55 <input type="radio"/> 85 <input type="radio"/> 110      Other _____			
AMOUNT IN DRUM: <input type="radio"/> Full <input type="radio"/> 75% <input type="radio"/> 50% <input type="radio"/> 25% <input type="radio"/> 10%			
<input type="radio"/> <10% <input type="radio"/> MT <input type="radio"/> Drum Contains PPE in addition to its contents			
Layers	Phys. State	Color	Clarity
Top			
Middle			
Bottom			
		Layer Depth	Physical State= Solid/Liquid/Sludge/Gel Clarity= Clear/Cloudy/Opaque
			Field Screening Results:
		pH	Dosimeter      PID
DRUM LABELING AND MARKINGS			
Manufacture's Name _____		DOT Hazard Class _____	
Chemical Name _____		UN/NA _____	
Additional Information _____			
LABORATORY HAZSCAN DATA			
<input type="radio"/> Mark if laboratory Hazscan data matches the reported field data.		Hazscan Category _____	
If data does not match notify project contact immediately.		Analyst(s) _____	
Radiation <input type="radio"/> Positive <input type="radio"/> Negative    MR/HR		Date Performed _____	
REACTIVITY: AIR: <input type="radio"/> None <input type="radio"/> Top <input type="radio"/> Middle <input type="radio"/> Bottom    WATER: <input type="radio"/> None <input type="radio"/> Top <input type="radio"/> Middle <input type="radio"/> Bottom			
PHYSICAL PROPERTIES			
Layer(s)	Physical State	Color	Clarity
Top			
Middle			
Bottom			
CHEMICAL PROPERTIES			
Layer(s)	pH	Peroxide	Oxidizer
	0-14	+ or -	+ or -
Top			
Middle			
Bottom			
Cyanide      Sulfide      Bielsstein      Flashpoint			
+ or -      + or -      + or -      <60 C			
Comments _____			
Additional Spot or Strip Test Results _____			
Hazscan Bulk Group Number _____		PCB Concentration _____	
Data Reviewer and Date _____		T & D Waste Group Number _____	
CHAIN OF CUSTODY			
TRANSFER NUMBER	TRANSFERS RELINQUISHED BY:		TRANSFERS ACCEPTED BY:
			DATE TIME

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SOIL TEST BORING RECORD													
<b>KIBER ENVIRONMENTAL SERVICES, INC.</b> <b>ATLANTA, GEORGIA</b>				JOB NO. _____		BORING NO. _____							
				JOB NAME _____		GROUND SURFACE ELEV. _____							
				DATE _____		HOURS DRILLING _____							
				WEATHER _____		HOURS MOVING _____							
				DRILLER _____		PAGE _____ OF _____							
DEPTH <small>feet</small>	STRATA DESCRIPTION	#	STP				N	P	R	I	D	C	SOIL CLASSIFICATION AND REMARKS
			1	2	3	4							

BORING TERMINATED: \_\_\_\_\_  
 BORING REFUSAL: \_\_\_\_\_  
 WATER TOB DEPTH: \_\_\_\_\_  
 WATER 24 HR DEPTH: \_\_\_\_\_  
 WATER LOSSES: \_\_\_\_\_  
 CASING: SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_

METHOD OF ADVANCING BORING	DEPTH
HOLLOW STEM AUGER	TO
ROTARY DRILL: W/MUD; W/WATER	TO
OTHER	TO

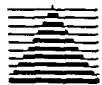
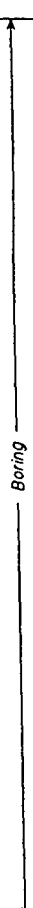
CA/QC

INSTALLED BY: \_\_\_\_\_

CHECKED BY: \_\_\_\_\_

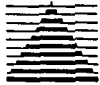
DISCREPANCIES: \_\_\_\_\_

102042

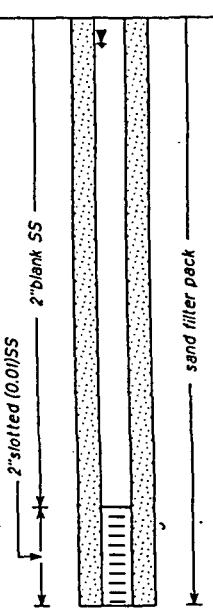
 <b>KIBER</b> ENVIRONMENTAL SERVICES, INC.		<b>SUBSURFACE DRILL LOG</b>		<b>SB-1</b> Page 1 of 1			
PROJECT:			LOCATION: <i>SUFFERN, NY</i>				
DATE DRILLED: <i>1/3/96 - 1/3/96</i>			SURFACE ELEVATION: <i>Feet MSLD</i>				
DRILLING METHOD: <i>6.25 in Hollow Stem Auger</i>			TOTAL DEPTH: <i>25 Feet</i>				
DRILLING COMPANY: <i>AQUIFER DRILLING &amp; TESTING</i>			GEOLOGIST: <i>Jack Wintle</i>				
DEPTH (feet)	SAMPLE INTERVAL	SAMPLE NUMBER	BLONS/FT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	WELL DIAGRAM
5	X	SS-1	6-6-8	[Symbol: Small circles]	SM	TILL  Brown slightly silty medium to coarse SAND	
10	X	SS-2	1-1-1	[Symbol: Larger circles]	SP		
15							
20							
25						Boring Terminated @ 25 Feet	

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 <b>KIBER</b> ENVIRONMENTAL SERVICES, INC.		<b>SUBSURFACE DRILL LOG</b>		<b>MW-4BR</b>  Page 2 of 2	
PROJECT:			LOCATION: <i>Greenville, Georgia</i>		
DATE DRILLED: <i>3/30/95 - 3/30/95</i>			SURFACE ELEVATION: <i>789.8 Feet MSLD</i>		
DRILLING METHOD: <i>6.25 in Hollow Stem Auger</i>			TOTAL DEPTH: <i>52 Feet</i>		
DRILLING COMPANY: <i>Kilman Brothers</i>			GEOLOGIST: <i>Jack Wintle</i>		

DEPTH (feet)	SAMPLE INTERVAL	CORING RUN NUMBER	* RECOVERY	* ROD	LITHOLOGY	GEOLOGIC DESCRIPTION	WELL DIAGRAM
25		1	100	99		BEGAN CORING AT 22 FEET. BIOTITE GNEISS	
30							
35		2	100	100			
40							
45		3	100	100			
50						Coring Terminated at 52 feet.	
55							
60							
65							
70							

JOB NUMBER: 1226

102044

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KIBER ENVIRONMENTAL SERVICES, INC.

LAB NO.:		SAMPLE NO.:	
DATE:	TIME:	COLLECTED BY:	
SAMPLING SITE:			
TESTS REQUIRED:		PRESERVATIVE	

**CUSTODY SEAL**

DATE \_\_\_\_\_

SIGNATURE \_\_\_\_\_

**CHEM**  
Specialty Cleaned Containers  
(800) 443-7777  
(800) 553-3333



### SAMPLE CILAIN-OF-CUSTODY RECORD

COC#

3786 DEKALB TECHNOLOGY PARKWAY

ATLANTA, GEORGIA 30340-3603

(770) 455-3944 FAX (770) 451-0155

[illegible]

REV 372557

\* checks = 4 degrees Celsius, Dry Weight Results is Default for Solid/Applyable Wares

Company template loc 1, wk 4

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KIBER ENVIRONMENTAL SERVICES, INC.  
 TREATABILITY LABORATORY  
 SAMPLE LOGIN

PROJECT NAME \_\_\_\_\_  
 PROJECT # \_\_\_\_\_ PROJECT MGR. \_\_\_\_\_

SAMPLE RECEIPT AND LOGIN

Date Received	Sample ID	
Courier	Custody Seal	COC (Y/N)
Type of Container	Temp upon Receipt	Storage
Homogenized / Lumpified?		
Comments		

SAMPLE CONDITIONS

Matrix	Wt / Vol of Material	PID (ppm)
Description/Comments		
Debris Separated (Y/N)	Wt of Debris	Wt of Usable Sample
Description/Comments		

PHYSICAL PROPERTIES

ANALYTICAL SAMPLES

DATE	PARAMETER	DATE	PARAMETER	DATE	PARAMETER	DATE	PARAMETER

SAMPLE RETURN / DISPOSAL

Date	Comments

SOH15SAMPLE

**KIBER ENVIRONMENTAL SERVICES, INC.**

3786 Dekalb Technology Parkway, NE  
Atlanta, GA 30340

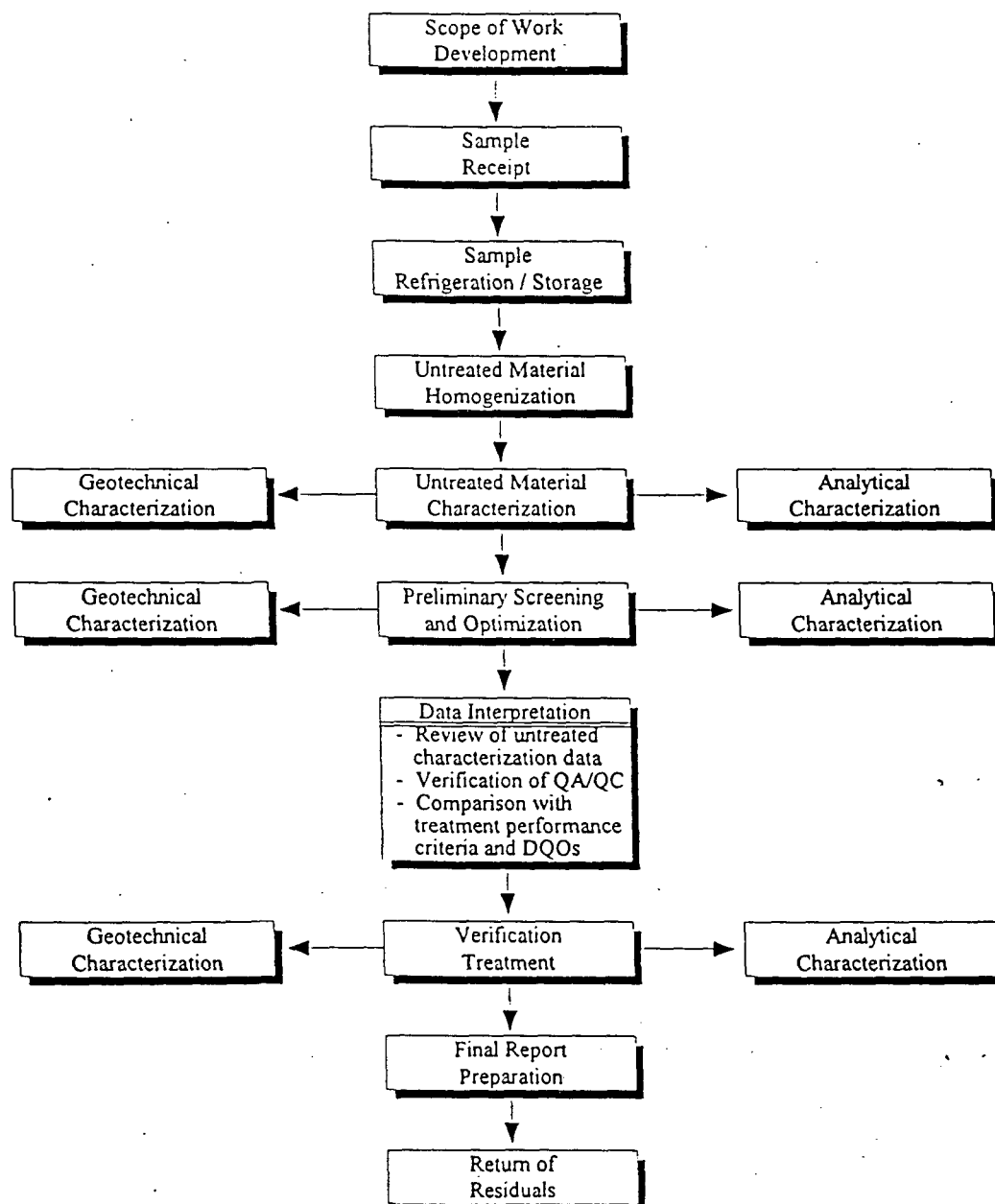
Sample Disposal Tracking Form							
KES#	Sample#	Container	Date	KES#	Sample#	Container	Date
406006	1-6	95-003	3/13/95	406073	1-9	95-003	3/13/95
EP4060101	NA	95-003	3/13/95	406041	1-3	95-003	3/13/95
406014	1-2	95-003	3/13/95	SPLP4062001	NA	95-003	3/13/95
406014	1-2	95-003	3/13/95	406038	1	95-003	3/13/95
406011	1-7	95-003	3/13/95	TB4062801	NA	95-003	3/13/95
TB4060701	NA	95-003	3/13/95	406063	1-2	95-003	3/13/95
TB4060702	NA	95-003	3/13/95	406068	1-2	95-003	3/13/95
406007	1-3	95-003	3/13/95	SPLP4062801	NA	95-003	3/13/95
TB4060601	NA	95-003	3/13/95	406069	1	95-003	3/13/95
EP4061001	NA	95-003	3/13/95	TB4060601	NA	95-003	3/13/95
TB4060901	NA	95-003	3/13/95	406076	1-4	95-003	3/13/95
406015	1	95-003	3/13/95	STLB4061601	NA	95-003	3/13/95
406021	1	95-003	3/13/95	406031	1-5	95-003	3/13/95
TB4061401	NA	95-003	3/13/95	STLC4062901	1-4	95-003	3/13/95
TB4061402	NA	95-003	3/13/95	EP4070701	NA	95-003	3/13/95
406026	1-6	95-003	3/13/95	407037	2	95-003	3/13/95
406028	1-4	95-003	3/13/95	TB4072901	NA	95-003	3/13/95
TB4061501	NA	95-003	3/13/95	407004	1-3	95-003	3/13/95
406030	1-2	95-003	3/13/95	TB4070602	NA	95-003	3/13/95
TB4061701	NA	95-003	3/13/95	TB4070603	NA	95-003	3/13/95
406034	1-4	95-003	3/13/95	407009	1-5	95-003	3/13/95
TB4062301	NA	95-003	3/13/95	TB4070701	NA	95-003	3/13/95
406051	1	95-003	3/13/95	TB4070702	NA	95-003	3/13/95
TB4062701	NA	95-003	3/13/95	407010	1	95-003	3/13/95
406055	2	95-003	3/13/95	407012	1	95-003	3/13/95

3786 Dekalb Technology Parkway, NE  
Atlanta, GA 30340

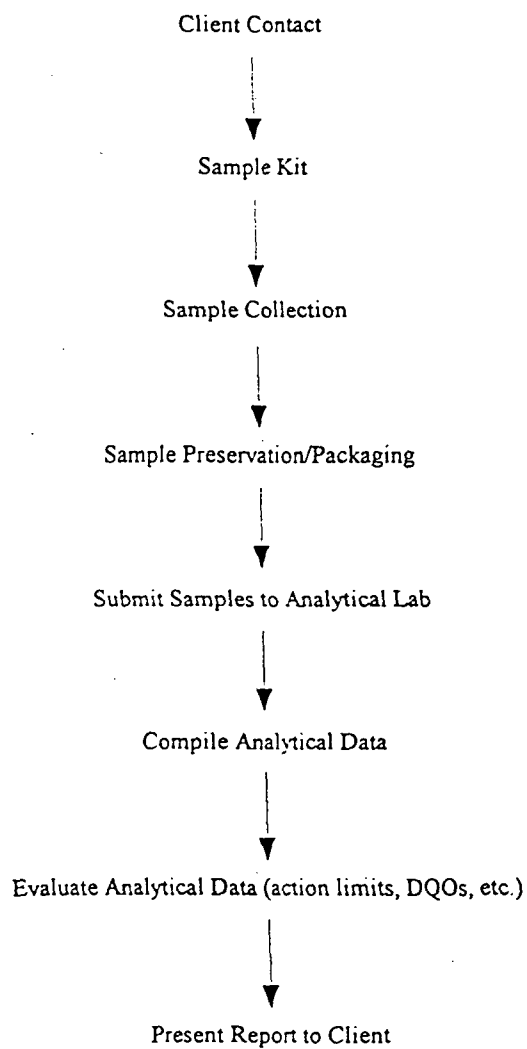
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KIBER-ENVIRONMENTAL SERVICES, INC.  
TECHNICAL SERVICES DIVISION  
TREATABILITY STUDY FLOW DIAGRAM



## Consulting-Remediation Study Flow Diagram





Atlanta, GA 30340

[illegible]

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102052

### PIPET CALIBRATION LOG

[illegible]



KJBER ENVIRONMENTAL SERVICES, INC.

PROJECT SPECIFIC INFORMATION  
FOR ANALYTICAL SUBMITTALS

Project Name / #: \_\_\_\_\_

Project Manager: \_\_\_\_\_

Due Date: \_\_\_\_\_

QA/QC Requirements: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Sampling/Analysis History: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Special Requirements: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**KIBER ENVIRONMENTAL SERVICES, INC.**

3786 Dekalb Technology Parkway, NE  
 Atlanta, GA 30340

**SAFETY AND HOUSEKEEPING CHECKLIST**

Date Issued: \_\_\_\_\_

Inspected by: \_\_\_\_\_

Section A - Safety Requirements		Y	N
1	Are employees properly wearing necessary face and eye protection?		
2	Are employees properly wearing gloves?		
3	Are employees properly wearing lab coats?		
4	Are employees wearing full cover shoes and socks?		
5	Are spill kits available and properly stocked?		
6	Have the safety showers/eyewash stations been operationally checked within 30 days?		
7	Have the fume hoods been checked within 90 days?		
8	Are fire extinguishers accessible and fully charged (arrow in the green)?		
9	Is the emergency lighting operational?		
10	Are gas cylinders properly secured?		
11	Are employees eating, drinking, or chewing in the laboratory?		
12	Are electrical cords in good repair and properly utilized?		
13	Are First-Aid Kits available and properly stocked?		
14	Are respirators available, clean, and ready for use?		
Section B - Housekeeping Requirements		Y	N
1	Is waste containment area locked?		
2	Have trash bags, liquid carboys and other determined wastes been removed?		
3	Are the trash and waste receptacles properly labeled and not overflowing?		
4	Is waste being properly segregated?		
5	Are emergency exits, walkways, sinks, eyewash stations, balance area, instruments, fume hoods and countertops maintained clean and free of hazards?		
6	Are areas clean at shifts end?		
7	Are samples being returned to controlled storage when not in use (as applicable)?		
8	Are chemicals properly stored?		
9	Are any chemicals expired?		
10	Are all waste storage containers closed?		
<b>Comments</b>			
<b>Resolutions</b>			
Reviewed by: _____		Date: _____	

TABLE 1

ANALYSIS REFERENCE CHART

ORGANIC CHEMISTRY					
Analysis	Container (Glass and Teflon lined caps only)	Preservative (Chill to 4°C)	Container (Glass and Teflon lined caps only)	Holding Time (From Sampling Date)	
<b>VOLATILE ORGANICS</b>	<b>WATER</b>	<b>WATER</b>	<b>SOIL</b>	<b>WATER</b>	<b>SOIL</b>
8010/8020	2X VOA (Headspace Free)	3 drops HCl(a)	2x 40ml & 1x 400ml (Chill to 4°C)	14 days-Pres. 7 days-Unp.	14 days until Analysis
8010	2X VOA (Headspace Free)	3 drops HCl(a)	2x 40ml & 1x 400ml (Chill to 4°C)	14 days-Pres. 7 days-Unp.	14 days until Analysis
8020	2X VOA (Headspace Free)	3 drops HCl(a)	2x 40ml & 1x 400ml (Chill to 4°C)	14 days-Pres. 7 days-Unp.	14 days until Analysis
8240/8260	2X VOA (Headspace Free)	3 drops HCl(a)	2x 40ml & 1x 400ml (Chill to 4°C)	14 days-Pres. 7 days-Unp.	14 days until Analysis
BTEX	2X VOA (Headspace Free)	3 drops HCl(a)	2x 40ml & 1x 400ml (Chill to 4°C)	14 days-Pres. 7 days-Unp.	14 days until Analysis
Modified 8015 (TPH) Gasoline Range	2X VOA (Headspace Free)	3 drops HCl(a)	2x 40ml & 1x 400ml (Chill to 4°C)	14 days-Pres. 7 days-Unp.	14 days until Analysis
TCLP Volatiles (zero head space extraction)	N/A	N/A	4 oz jar (Chill to 4°C)	N/A	14 days to Extract/14 days after for analysis
<b>SEMI-VOLATILE ORGANICS</b>					
Modified 8015 (TPH) Diesel Range	1 L Glass	Unpreserved	8 oz jar (Chill to 4°C)	7 days until Analysis 40 days after Extraction until Analysis	14 days until Analysis 40 days after Extraction until Analysis
Ethyl Dibromide (EDB)	1 L Amber Glass	Unpreserved	8 oz jar (Chill to 4°C)	28 days until Analysis	28 days until Analysis
8040	2 x 1 L Amber Glass	Unpreserved	8 oz jar (Chill to 4°C)	7 days until Extraction 40 days after Extraction until Analysis	14 days until Extraction 40 days after Extraction until Analysis
8081	2 x 1 L Amber Glass	Unpreserved, I, J	8 oz jar (Chill to 4°C)	7 days until Extraction 40 days after Extraction until Analysis	14 days until Extraction 40 days after Extraction until Analysis
8082	2 x 1 L Amber Glass	Unpreserved, I	8 oz jar (Chill to 4°C)	7 days until Extraction 40 days after Extraction until Analysis	14 days until Extraction 40 days after Extraction until Analysis
8100/8310	2 x 1 L Amber Glass	Unpreserved	8 oz jar (Chill to 4°C)	7 days until Extraction 40 days after Extraction until Analysis	14 days until Extraction 40 days after Extraction until Analysis
8140	2 x 1 L Amber Glass	Unpreserved	8 oz jar (Chill to 4°C)	7 days until Extraction 40 days after Extraction until Analysis	14 days until Extraction 40 days after Extraction until Analysis
8150	2 x 1 L Amber Glass	Unpreserved	8 oz jar (Chill to 4°C)	7 days until Extraction 40 days after Extraction until Analysis	14 days until Extraction 40 days after Extraction until Analysis
Modified 619	2 x 1 L Amber Glass	Unpreserved	8 oz jar (Chill to 4°C)	7 days until Extraction 40 days after Extraction until Analysis	14 days until Extraction 40 days after Extraction until Analysis
8270	2 x 1 L Amber Glass	Unpreserved	8 oz jar (Chill to 4°C)	7 days until Extraction 40 days after Extraction until Analysis	14 days until Extraction 40 days after Extraction until Analysis
Modified 632	2 x 1 L Amber Glass	Unpreserved	8 oz jar (Chill to 4°C)	7 days until Extraction 40 days after Extraction until Analysis	14 days until Extraction 40 days after Extraction until Analysis
TCLP Non-Volatiles	N/A	N/A	16 oz jar (Chill to 4°C)	N/A	14 days until TCLP leaching
<b>METALS</b>					
Metals (1 or more metals)					
Total	16 oz Plastic	1 ml HNO <sub>3</sub> (a)	4 oz jar (Chill to 4°C)	6 mo (28 days-Hg)	6 mo
Dissolved Filtered in Field	16 oz Plastic	1 ml HNO <sub>3</sub> (a)	N/A	6 mo (28 days-Hg)	N/A
Not Filtered (Specify Lab to filter)	16 oz Plastic	Unpreserved	N/A	6 mo (28 days-Hg)	N/A
Organic Lead	8 oz Amber Glass (Glass Only) w/Septum (Headspace Free)	Unpreserved Chill to 4°C	4 oz jar (Chill to 4°C)	14 days until Analysis	14 days until Analysis
Soluble	N/A	N/A	4 oz jar (Chill to 4°C)	N/A	6 mo
Hexavalent Chromium (Cr-6)	16 oz Plastic	Unpreserved	4 oz jar (Chill to 4°C)	24 hr	28 days
EP Toxicity	N/A	N/A	8 oz jar (Chill to 4°C)	N/A	6 mo
WET	N/A	N/A	8 oz jar (Chill to 4°C)	N/A	6 mo
TCLP (see also Organic Chemistry)	N/A	N/A	8 oz jar (Chill to 4°C)	N/A	6 mo
<b>NOTES</b>					
Fill all containers as much as possible. (Consult laboratory for minimum volume required.)			A. Preservative needed to bring the pH < 2 B. Additional volumes may be required-consult laboratory for recommendations C. Preservative needed to bring the pH > 12 D. Sample does not need to be chilled E. Preservative needed to bring the pH > 9 F. Applicable to all hydrocarbons in the Gasoline hydrocarbon range G. Applicable to all hydrocarbons in the Diesel hydrocarbon range H. Laboratory recommended holding time I. Adjust pH 5-9; otherwise analyze within 72 hours J. For Aldrin analysis, add 3 ml of sodium thiosulfate / gallon of sample K. at least 2 40ml vials & 1 4 oz jar, 1st vial w/ -1 g sodium bisulfate + 5 ml reagent water; 2nd vial w/ 10ml P&T methanol; 4 oz no chemical preservative		
Holding time = the samples must be analyzed within the required time frame.			VOA = 40 ml vial w/septum 4 oz jar holds approx. 100-150g 8 oz jar holds approx. 300-400g 16 oz jar holds approx. 600-800g		
Most tests require samples to remain chilled @ 4°C after sampling.					

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TABLE I

ANALYSIS REFERENCE CHART

GENERAL/INORGANIC CHEMISTRY					
Analysis	Container	Preservative (Chill to 4°C)	Container (Chill to 4°C)	Holding Time (From Sampling Date)	
	WATER		SOIL	WATER	SOIL
Alkalinity	4 oz Plastic	Unpreserved	N/A	14 days	N/A
Ammonia (NH <sub>3</sub> )	8 oz Plastic	25 ml H <sub>2</sub> SO <sub>4</sub> (a)	4 oz jar	28 days	28 days*
BOD	16 oz Plastic (Headspace Free)	Unpreserved	N/A	48 hr	N/A
Boron	4 oz Plastic (Plastic Only)	Unpreserved	4 oz jar	28 days	28 days*
Bromide	16 oz Plastic	Unpreserved	8 oz jar	28 days	28 days*
Chloride	4 oz Plastic	Unpreserved	8 oz jar	28 days	28 days*
COD	4 oz Plastic	25 ml H <sub>2</sub> SO <sub>4</sub> (a)	4 oz jar	28 days	28 days
Color	4 oz Plastic	Unpreserved	N/A	48 hr	N/A
Cyanide (total and/or amenable)	16 oz Plastic(m)	2 ml 1.5N NaOH(c)	4 oz jar	14 days	14 days
EC (Electrical Conductivity)	4 oz Plastic	Unpreserved	4 oz jar	28 days	28 days
Flashpoint	8 oz Amber Glass (Glass Only)	Unpreserved	8 oz jar	28 days	28 days
Fluoride	4 oz Plastic	Unpreserved	4 oz jar	28 days	28 days*
Formaldehyde	1 L Glass	1% Methanol	4 oz jar	28 days-Pres.	28 days
General Minerals	1 L Plastic	Unpreserved			
Gross Alpha/Beta	1 L Plastic	2 ml HNO <sub>3</sub> (a)(m)	4 oz jar	6 mo	6 mo
Hardness	8 oz Plastic	HNO <sub>3</sub> (a)	N/A	6 mo	N/A
Hexavalent Chromium (Cr <sub>6</sub> )	16 oz Plastic	Unpreserved	4 oz jar	24 hr	No specified time
Iodide	4 oz Plastic	Unpreserved	4 oz jar	24 hr	28 days*
Nitrate/Nitrite (NO <sub>3</sub> /NO <sub>2</sub> )	4 oz Plastic	25 ml H <sub>2</sub> SO <sub>4</sub> (a)	4 oz jar	28 days	28 days*
NO <sub>3</sub>	4 oz Plastic	Unpreserved	4 oz jar	48 hr	28 days*
Odor	4 oz Glass	Unpreserved	N/A	48 hr	N/A
Oil & Grease	1 L Glass (Glass Only)(m)	2 ml H <sub>2</sub> SO <sub>4</sub> (a)	4 oz jar	28 days	28 days
418.1 (TPH by IR)	1 L Glass (Glass Only)(m)	2 ml H <sub>2</sub> SO <sub>4</sub> (a)	4 oz jar	28 days	28 days
Oil	4 oz Plastic	Unpreserved	4 oz jar	immediately	14 days
Phenolics	4 oz Amber Glass (Glass Only)(m)	25 ml H <sub>2</sub> SO <sub>4</sub> (a)	4 oz jar	28 days	28 days
Phosphorus Total (P)	4 oz/8 oz Plastic	25 ml/2 ml H <sub>2</sub> SO <sub>4</sub> (a)	4 oz jar	28 days	28 days
Phosphorus Ortho (P <sub>O</sub> )	4 oz/8 oz Plastic	Unpreserved (filter immediately)	4 oz jar	48 hr	N/A
Silica	4 oz Plastic (Plastic Only)	Unpreserved	4 oz jar	28 days	28 days*
Solids (Residue) Total dissolved	16 oz Plastic	Unpreserved	N/A	7 days	N/A
Solids (Residue) Total suspended	16 oz Plastic	Unpreserved	N/A	7 days	N/A
Solids (Residue) Total settleable	1 L Plastic	Unpreserved	N/A	48 hr	N/A
Solids (Residue) Total solids	16 oz Plastic	Unpreserved	N/A	7 days	N/A
Specific Gravity	4 oz Plastic	Unpreserved	4 oz jar	28 days	28 days
Sulfate	4 oz Plastic	Unpreserved	4 oz jar	28 days	28 days*
Sulfide	4 oz Plastic(m)	6 drops 2N Zn acetate & 8 drops 6N NaOH(c)	N/A	7 days	N/A
Sulfite	4 oz Plastic	1 ml EDTA	N/A	28 days-Pres. 6 hr-Unp.	N/A
Surfactants (MBAS)	1 L Plastic	Unpreserved	N/A	48 hr	N/A
Total Coliform	8 oz Glass or Nalgene (Sterilized)	Unpreserved	N/A	6-8 hr	N/A
TKN (Kjeldahl Nitrogen)	16 oz Plastic	25 ml H <sub>2</sub> SO <sub>4</sub> (a)	4 oz jar	28 days	No Specified Time
Total Organic Carbon (TOC)	4 oz Amber Glass (Glass Only)	25 ml H <sub>2</sub> SO <sub>4</sub> (a)	4 oz jar	28 days	28 days
Total Organic Halide (TOX)	8 oz Amber Glass (Glass Only)	.5 ml H <sub>2</sub> SO <sub>4</sub> (a)	4 oz jar	7 days	No Specified Time
Total Radium	1 L Plastic	2 ml HNO <sub>3</sub> (a)(m)	4 oz jar	6 mo	6 mo
Turbidity	4 oz Plastic	Unpreserved	N/A	48 hr	N/A

\*Analyses completed on water/soil leachate. Holding times are noted from the date of leachate completion.

The analyses and requirements shown are in accordance with the following references:

1. Test Methods for Evaluating Solid Waste, U.S. EPA SW-846; September 1987 & Update II.
2. NIOSH Manual of Analytical Methods, U.S. Department of Health, Education, and Welfare; Second Edition, 1977.
3. LUST Field Manual, California State Water Resources Control Board, October 1989.
4. Methods for Chemical Analysis of Water and Wastes, U.S. EPA-600/4-79-020, March 1983.

5. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, U.S. EPA-600/4-82-057, July 1982.
6. Methods for the Determination of Organic Compounds in Drinking Water, U.S. EPA/600/4-88-039, December 1988.

7. Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WPCF; 16th Edition, 1985.

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# SAMPLING AND RELATED FIELD EQUIPMENT

*Kiber Environmental Services, Inc.*

Table 2

<i>Equipment Type</i>	<i>Construction/Grade</i>	<i>Use</i>	<i>Parameter Groups</i>
<b>Groundwater Sampling</b>			
Centrifugal Pump	Metal Case/Teflon Tubing	Purging	Demands, Metals and Extractable Organics
Peristaltic Pump	Metal Case/Teflon Tubing	Purging	Demands, Metals and Extractable Organics
Submersible Pump	Teflon or Stainless Steel	Purging	Demands, Metals and Extractable Organics
	Teflon or Stainless Steel	Sampling	Demands, Metals and Extractable Organics
Bailer	Teflon	Purging-(if necessary)	All Parameter Groups
	Teflon	Sampling	Demands, Metals, VOA's Extractable Organics
Hand Pump	Teflon	Purging	Demands, Metals and Extractable Organics
<b>Surface Water Sampling</b>			
Dacon Bomb	Stainless Steel	Sampling Depth Definition	Demands, Metals, VOA's Extractable Organics
Wheaton Sampler	Glass	Sampling	Demands, Metals, VOA's Extractable Organics
<b>Sediments/Soils and Sludges</b>			
Trowel, Spoon or Scoop	Teflon or Stainless Steel	Sampling	Demands, Metals, VOA's Extractable Organics
Mixing Bowl	Glass (Pyrex) or Stainless Steel	Sampling/Compositing	Demands, Metals Extractable Organics
Hand Auger	Stainless Steel	Sampling	Demands, Metals, VOA's Extractable Organics
Split Spoon	Stainless Steel	Sampling	Demands, Metals, VOA's Extractable Organics
Shelby Tube	Galvanized Steel	Sampling	Demands, VOA's and Extractable Organics

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<i>Equipment Type</i>	<i>Construction/Grade</i>	<i>Use</i>	<i>Parameter Groups</i>
Trier	Stainless Steel	Sampling	Demands, Metals, VOA's Extractable Organics
Sludge Scoop	Stainless Steel/Teflon	Sampling	Demands, Metals, VOA's Extractable Organics
Ponar Grab	Stainless Steel	Sampling	Demands, Metals, VOA's Extractable Organics
Wildco Sampler	Teflon/Stainless Steel	Sampling	Demands, Metals, VOA's Extractable Organics
<b>Drum and Tank Sampling</b>			
Dip Tubes	Glass	Sampling	All Parameter Groups
Trowel, Spoon, or Scoop	Stainless Steel	Sampling	Demands, Metals, VOA's Extractable Organics
Bacon Bomb	Stainless Steel	Sampling	Demands, Metals, VOA's Extractable Organics
Sludge Judge	PVC, Teflon or Polyethylene	Depth and Layering	NA
Chisel Hammer	Stainless Steel or Brass	Sampling	Demands, Metals, VOA's Extractable Organics
<b>Sample Storage and Transport Equipment</b>			
Sample Coolers	Plastic or Steel	Sample Shipment	All Groups- VOA's separately
Sample Jars and Bottles	Glass or Plastic	Sample Containment	as required per 40 CFR
Sample Labels	Paper	Sample Identification	All Groups
Chain of Custodies	NA	Sample Documentation and C-O-C	All Groups
Chain of Custody Seals	NA	Sample Documentation and C-O-C	All Groups
Strapping Tape	NA	Sample Shipment	All Groups

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<i>Equipment Type</i>	<i>Construction/Grade</i>	<i>Use</i>	<i>Parameter Groups</i>
<b>Miscellaneous Equipment</b>			
Graduated Five Gallon Bucket	Plastic	Purging	All Groups
Water Finder Paste	NA	Depth or Layering Determination	NA
Water Level Indicator	Teflon encased probe Teflon coated line	Water Depth Determination	NA
Oil/Water Interface Probe	Teflon encased probe Teflon coated line	Oil Layer Determination	NA
Sample Flags	no specific requirements	Marking Sampling Point	All Groups-Solids
Brass-Bung Wrench	Brass	Opening Drum Bungs	All Groups
Sample Log Book	NA	Sample Documentation	All Groups
Scrub Brushes	NA	Equipment Decontamination	All Groups
<b>Sampling Reagents and Cleaning Materials</b>			
Sodium Hydroxide	Ultra Purity	Sample Preservation	All Groups
Nitric Acid	Ultra Purity	Sample Preservation	All Groups
Sodium Thiosulfate	Ultra Purity	Sample Preservation	All Groups
Sulfuric Acid	Ultra Purity	Sample Preservation	All Groups
Hydrochloric Acid	Ultra Purity	Sample Preservation	All Groups
Sodium Sulfite	Ultra Purity	Sample Preservation	All Groups
Hexane	Ultra Purity	Sample Decontamination	All Groups
Isopropanol	Ultra Purity	Sample Decontamination	All Groups

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<i>Equipment Type</i>	<i>Construction/Grade</i>	<i>Use</i>	<i>Parameter Groups</i>
Liquinox	Ultra Purity	Sample Decontamination	All Groups
Deionized Water	NA	Sample Decontamination	All Groups
<b>Field Analytical Instrumentation</b>			
Personal Sampler Calibrator	303	SKC	All Groups
Personal Air Sampling Pumps	224-PCXR7	SKC	All Groups
Conductivity Meter	124	Orion	NA
Portable Turbidimeter	2100P	HAACH	NA
High Volume Air Sampler	Aircon 2	Gilliam	NA
Photoionizer	PID	HNU	NA
Organic Vapor Analyzer	FID	Foxboro	NA
pH Meter	Accumet 1002	Fischer Science	NA
NA = Not Applicable			



## EQUIPMENT THAT LEAVES KIBER

Revised 8-15-98

	EQUIPMENT	JOB SITE	CITY/STATE	MODEL #	VALUE	KIBER TAG
1	Sawzall - Milwaukee (Aggregate)	Kiber	Atlanta, GA	MIT6509-6		
2	Sears/Craftsman Wet/Dry Vac	Kiber	Atlanta, GA	90204V1342		
3	Honda Generator	Kiber	Atlanta, GA	EAG-4040926		
4	Submersible Pump	Kiber	Atlanta, GA	563.269400		
5	Water Level Indicator	Kiber	Atlanta, GA	15276		
6	Drill Rig Air Pump	Kiber	Atlanta, GA	0490		
7	Drill Rig Drill	Kiber	Atlanta, GA	740-4149		
8	HNU Meter	Kiber	Atlanta, GA			
9	Magnetic Locator	Kiber	Atlanta, GA	GA25B		
10	Wheaton Sampler	Kiber	Atlanta, GA	990250		
11	Conductivity Meter	Kiber	Atlanta, GA	9811040		
12	Wildco Sampler	Kiber	Atlanta, GA	2424 A-25		
13	Tuff Box #1	Kiber	Atlanta, GA			
14	Tuff Box #2	Kiber	Atlanta, GA			
15	Compaq Centura Computer	Kiber	Atlanta, GA	7316HDW30189		
16	Hand Mixer Auger	Kiber	Atlanta, GA			
17	Motorola Walkie Talkie	Kiber	Atlanta, GA	446AHG0167		
18	Motorola Charger	Kiber	Atlanta, GA	NTN4787A		
19	Motorola Walkie Talkie	Kiber	Atlanta, GA	943K88849		
20	Motorola Charger	Kiber	Atlanta, GA	NLN7175A		
21	Realistic Voice Operated Radio	Kiber	Atlanta, GA	0040460		
22	Realistic Voice Operated Radio	Kiber	Atlanta, GA	0040118		
23	Keck Instruments Interface Probe	Kiber	Atlanta, GA			
24	3' Stainless Steel Balor	Kiber	Atlanta, GA			
25	Compaq Concerto Computer	Kiber	Atlanta, GA			
26	Gundfos Redi=Flo II	Kiber	Atlanta, GA	P193181616		
27	Grundfos Pump	Kiber	Atlanta, GA	1A106003		
28	Regent Portable Light	Kiber	Atlanta, GA	5L500		
29	Regent Portable Light	Kiber	Atlanta, GA	PQ33		
30	Motorola Beeper	Kiber	Atlanta, GA	1176826		
31	Motorola Beeper	Kiber	Atlanta, GA	1147047		
32	Portable Air Tank	Kiber	Atlanta, GA			
33	Sump Pump	Kiber	Atlanta, GA	2945		
34	Box Phone	Kiber	Atlanta, GA			
35	ABS Sump Pump	Kiber	Atlanta, GA	417719		
36	Flotec Sump Pump	Kiber	Atlanta, GA	1B95L		
37	Rapid Tester Set Flash Equip.	Kiber	Atlanta, GA			
38	Honda Excell Power Washer	Kiber	Atlanta, GA	05305		
39	Van Ark Needle Scale (Sase)	Kiber	Atlanta, GA	S/N24332		
40	Cart for cutting torch	Kiber	Atlanta, GA			
41	Cutting torch assembly (Air Products)	Kiber	Atlanta, GA			
42	Chop saw - Stihl (Aggregate)	Kiber	Atlanta, GA	125135397		
43	Tornado Drum Vac (Tornado)	Kiber	Atlanta, GA	1738		
44	Motorola Cell Flip Phone, Case & Battery	Kiber	Atlanta, GA	76090WARSA		
45	AT&T Answering Machine	Kiber	Atlanta, GA	1308		
46	AT&T Answering Machine	Kiber	Atlanta, GA	1311		
47	General Electric Phone	Kiber	Atlanta, GA	2-9285D		
48	Sharp Fax Machine	Kiber	Atlanta, GA	4714654X		
49	Diaphragm Pump & Hoses	Kiber	Atlanta, GA	H91-1520		
50	Honda Excel Power Washer	Kiber	Atlanta, GA			
51	Portable Electric Air Compressor	Kiber	Atlanta, GA	3Z124C		
52	Fire Safe	Kiber	Atlanta, GA			
53	Super Sawzall (Granger)	Kiber	Atlanta, GA	2AC04-1		
54	Shoop Vac (Craftsman)	Kiber	Atlanta, GA	95157V3526		
55	Hotsy 980 Pressure Washer	Kiber	Atlanta, GA	H31375		
56	ph Meter	Kiber	Atlanta, GA			
57	Refrigerator (Sam's)	Kiber	Atlanta, GA			
58	Microwave (Sam's)	Kiber	Atlanta, GA			
59	Motorola Radios - 7 - w/charger adapters	Kiber	Atlanta, GA	158FVGC827		
60	Motorola Radios - 7 - w/charger adapters	Kiber	Atlanta, GA	158FVGC974		
61	Motorola Radios - 7 - w/charger adapters	Kiber	Atlanta, GA	158FVGC808		
62	Motorola Radios - 7 - w/charger adapters	Kiber	Atlanta, GA	158FVE7666		
63	Motorola Radios - 7 - w/charger adapters	Kiber	Atlanta, GA	158FVE7656		
64	Toshiba Computer	Kiber	Atlanta, GA	1413321		

TABLE 4  
Kiber Environmental Services, Inc.  
Treatability Lab Equipment List

Equipment	Serial Number	Kiber ID
HNU-P.I.D. Photo-ionizer Unit Model GP 101	No Serial Number	00086
Photo-ionizer Probe	No Serial Number	
Liquid Release Tester	No Serial Number	00110
Rotary Extractor	No Serial Number	00025
Extractor Motor	548BFB-1804	00045
Quick Seal	28722	00020
Fisher Thermix Stirrer Model 120M	119	00016
Magnetic Stir Plate 6x6	175478	00017
Thermoline Type 1000 Stir Plate	27328929	00239
Magnetic Stir	235099	00014
Fisher Scientific Hot Stir Plate	560901133208	00015
Fisher Scientific Hot Plate	55900330	00288
Electrothermal Hot Plate		00018 00019
Magnetic Stir Plate 9x9 Model 4815	308333	00013
Ohaus Triple Beam Balance	N27	00042
Ohaus Triple Beam Balance	N30	00040
Ohaus Triple Beam Balance	N10	00041
Ohaus Precision Plus Digital Balance	2874	00073
Precisa 3100 CD Digital Balance	67110	
Mettler #PSN Digital Balance	719094	00043
Sartorius Balance	2903030	00044
Master Flex Speed Control	378445	00202

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**TABLE 4**  
**Kiber Environmental Services, Inc.**  
**Treatability Lab Equipment List**

<u>Equipment</u>	<u>Serial Number</u>	<u>Kiber ID</u>
Cole-Palmer Master Flex Pump	378220	00201
Master Flex Pump Heads		
5- Model 7013	No Serial Number	
5- Model 7016	No Serial Number	
Gilian Air Pumps	0045	00023
	0046	00024
	0032	00026
	0033	00027
Air Compressor	V9L108PFZC	00061
Breathing Air System	1357RM	00062
GE Vacuum Pump	1189	00070
Gast Vacuum Pump	0490	
Drager Pump Kit		00029
SKC Air Pump	513016	00090
	514984	00091
	513012	00086
Alphagaz Air-Flow Regulator	No Serial Number	00092
DR-2 Hach Portable H <sub>2</sub> O Analyzer Spectrophotometer	860101768	00083
2 Fisher Scientific Fume Hoods	No Serial Number	00076 00077
Phipps & Bird 6 Paddle Stirrer	No Serial Number	00088
Microscope & Light Source	312701424A	00030
Radiation Dosimeter	312691	00093
Unconfined Compressive Strength Testers (Load Frame)		
Model S-610 CBR/UCC	1090	00069
Model S-610	1160	
6,000 lbs. Load Cell Model E-214	198	
10,000 lbs. Load Cell Model E-216	177	
Linear Displacement Dial	J2-C-100-2000	
Linear Displacement Transducer (LTD) Model E-312	161	
3-Digital Read-Out Units Model E-400	1678	

TABLE 4  
Kiber Environmental Services, Inc.  
Treatability Lab Equipment List

Equipment	Serial Number	Kiber ID
	1137	
	926	00084
Four Channel Digital Read Out Model E-410	165	
5-Pressure Transducers Model S-E124	557 805 554 556 799	
Permeability Testing Panel Master Unit (Triaxial) Model S-500	No Serial Number	
2-Permeability Extension Panels Model S-502 (Triaxial)	No Serial Number	
5-Permeability Testing Cells	No Serial Number	
Nold Deaerator	No Serial Number	
3-Manometers with Header Model S-488	No Serial Number	
3-Permeability Testing Cells Constant Head	No Serial Number	
Consolidation Device S-450 Terraload	399	
Dial Indicator For Consolidometer E-805A	No Serial Number	
Floating Ring Consolidometer S-453	No Serial Number	
Fisher Scientific Muffle Furnace	211R0024	00022
Fisher Scientific Isotemp Oven Model 615G	10900106	00075
Isotemp Oven Model 655 F	11200318	00074
HTH Chlorine Test Kit		
Dissolved O <sub>2</sub> Meter	No Serial Number	00021
Fisher Accumant	3434	00071 925 pH meter
2 Orion pH Meters Model 230 A	007723 008073	00072
3 Orion pH Probes Model 9107	No Serial Number	

TABLE 4  
Kiber Environmental Services, Inc.  
Treatability Lab Equipment List

Equipment	Serial Number	Kiber ID
2 Accument pH Probes		
5 Fisher pH Electrode Probes		
1 CAS Silver Lable pH Probe		
Shelby Tube Extractor (Storage Room)	156019	00289
Mud Balance		00031
Hach Turbidimeter	920200000618	00032
Haake Viscotester	80064	00034
Haake Viscotester	79355	00033
Kitchen Aid Mixer	WB1100340 WC3439494 WC2092417 WC2642985 WB2201904	00035 00036 00037 00038 00039
Hobart Mixer (In Hood)	1874515	
Walk-in Cooler	DSL01108	
Sample Extruder Dayton Model 32C61	No Serial Number	
Omega Thermo-Hygrometer		
Hydrometers	583912 583949	
Dispersion Mixer Dispersion Cup	A2159 H-4265	
Atterberg Limit Apparatus	No Serial Number	
2 Proctor Hammers	No Serial Number	
2 4-Inch Proctor Molds	S-1, S-2	
1 6-Inch Proctor Molds	No Serial Number	
1 4-Inch Split Mold	H2	
Sieve Shaker	249	
<u>Sieve Size or Number</u>		<u>Quantity</u>
1 Inch		1
1/2 "		1
3/8 "		2
#4		2
#6		1
#10		2
#20		2
#40		3
#60		2
#140		2
#200		2

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TABLE 4  
Kiber Environmental Services, Inc.  
Treatability Lab Equipment List

<u>Equipment</u>	<u>Serial Number</u>	<u>Kiber ID</u>
CBR Molds		
CBR Swell Plates		
CBR Spacer Disk		
Surcharge Weights		
CBR Penetration Piston		
Digital Balance (.001g readout )		
Autoclave	184510	
Fisher Oven		
Centerfuge	5910A	
Magnet Funnels		
Vacuum Flasks		
Digital Thermometer		

**Table 5**

Instrument	Standard(s)	Frequency
<b>Field</b>		
Hg Sniffer	Mercury Vapor	Daily
HNU PID	Calibration Gas	Daily
Monitox: HCN/H <sub>2</sub> S	Service Technician	Biannually
DO Meter	Water/Winkler titration	Daily/Annually
Cumbersome Gas and O <sub>2</sub> Meter	Gas as Recommended (Sue)	Daily
Oxygen Alarm System	NA	Daily
Dust/Particulate Monitor	NA	Daily (when changing calibration constant)
Turbidity Meter	Gel Standards/Formazine	Daily/Annually (if daily fails)
Salinity, Conductivity, Temperature	KCl, Temperature: NIST Traceable	Daily/Daily
<b>Treatability</b>		
Consolidometer	Technician	Annually
Balances	Class SI Weights	Daily
Analytical Balance	Class SI Weights	Daily
Turbidity Meter	Gel Standards/Formazine	Daily
pH Meter	Buffers 4,7 and 10	Daily
Thermometers (ambient, walk-in, bio room)	NIST Traceable	Annually (electronic calibrated quarterly)
Pipet	NA	Quarterly
PID	Technician	Annually
Hach Meter	Individual Parameter Standards	Daily
Unconfined Compressive Strength	Technician	Annually
Permeability Testing	Technician	Annually

TABLE 6  
FIELD MONITORING EQUIPMENT PREVENTATIVE MAINTENANCE

INSTRUMENT	ACTIVITY	FREQUENCY
Combustible Gas and O <sub>2</sub> Alarm	Battery pack charging	As needed
	Clean sample inlet filter	Each time recharged
pH Meter	Inspect electrode probe and calibrate with reference standards. Keep moist.	Daily
	Check batteries and electronics for loose connections and cracked leads.	Daily
	Replace batteries	As needed
Drager Pump	Check bellows pump for cracks	Each use
Photoionization Detector	Clean Probe	Each use
	Clean lamp	As needed
	Check for proper operation and response	Daily
Monitor	Keep foam cushions moist	As needed
Mercury Vapor Detector	Change intake filter disc	After 20 hours use
	Change internal filter system	Yearly
	Change charcoal filter	Yearly
Mini Ram	Keep inlet free from moisture	Daily
Organic Vapor Analyzer	Recharge battery pack	After each use
	Recharge hydrogen tank with zero hydrogen to to 1500 - 2000 psi	As needed
	Check for proper operation and response	Daily
Water Level Indicator	Replace batteries	As needed
	Keep tape and probe free from contamination	Before and after each use



**TABLE 6**  
**FIELD MONITORING EQUIPMENT PREVENTATIVE MAINTENANCE**

INSTRUMENT	ACTIVITY	FREQUENCY
Dissolved Oxygen Meter	Clean probe and keep moist. Check for membrane deterioration. Check filling solution. Replace as needed.	Daily
	Replace batteries	As needed
Conductivity Meter	Replace Batteries	Every 200 hours or 6 months, whichever comes first
	Clean instrument surfaces prior to use. Inspect and clean conductance cell.	Daily
Turbidity Meter	Instrument surfaces are cleaned prior to use.	Daily
	Meter calibration is checked prior to use against "formazin calibrated" secondary gel standards	Daily
	Meter calibration using primary formazin standards	Quarterly or when the calibration check criteria are not met
	Options are cleaned using isopropanol and	Annually
	Clean instrument housing	Monthly
	Clean cells	Daily
Specific Conductance	Instrument surfaces are cleaned prior to use; the conductance cell is inspected and cleaned using 1:1	Daily
Specific Conductance(cont'd)	Calibration check is performed using a 0.01M potassium chloride (KCl) solution	Daily

TABLE 6  
FIELD MONITORING EQUIPMENT PREVENTATIVE MAINTENANCE

INSTRUMENT	ACTIVITY	FREQUENCY
	The dynamic range and the cell constant are verified by comparison to five calibration solutions	Monthly

**TABLE 7**  
**LABORATORY ROUTINE MAINTENANCE PROCEDURES**

INSTRUMENT	ACTIVITY	FREQUENCY
pH Meter	Gel-type electrodes are inspected daily and cleaned	Daily
	Meter is calibrated. If the calibration or the slope has deteriorated, the electrode is cleaned as above and treated with 1N hydrochloric acid (HCl), then recalibrated.	Daily
	pH electrodes are stored in fresh pH 7.0 solution when not in use.	Daily
	ISE electrodes and meter functional checks are maintained per the manufacturer's instructions.	Monthly
Ovens	Monitor temperature.	Daily
Refrigerator	Monitor temperature.	Daily
Analytical Balances	All balance surfaces are cleaned and covered when not in use.	Daily
	The analytical balance will be calibrated and cleaned by the manufacturer's representative.	Annually
	Labels are attached to each balance indicating the date of last calibration and annual service.	
	The accuracy of each balance is checked against Class "S" weights prior to use.	
Setaflash	Fill butane reservoir.	As needed
Infrared Spectrophotometer	The spectrophotometer is cleaned prior to use	Daily
	Optics are cleaned with isopropanol and Kim-wipes	Daily
	Cells are checked for chips or cracks	Each use

INSTRUMENT	ACTIVITY	FREQUENCY
Unconfined Compressive Strength	Cleaning	after every analysis
	Oiling	Quarterly
	Calibration of Load cell and LDTs	Annually
Perm Boards	Cleaning	after every analysis
	Calibration of Panels, and Pore Pressure Transducers	Annually

TABLE 8  
COMMON QA/QC SAMPLES, PROCEDURES AND PREPARATIONS

DESCRIPTION	CONCENTRATION PURPOSE	PROCEDURE	QA SAMPLE LEVEL	CONFIRMATION FREQUENCY
METHOD BLANK	TO DETECT GLASSWARE REAGENT CONTAMINATION	EXTRACTION OF A KNOWN BLANK MATRIX	LOW	ONE PER SAMPLE BATCH
MATRIX SPIKE	TO CHECK ACCURACY OF METHOD	SPIKE PREVIOUSLY ANALYZED SPIKE SAMPLE WITH KNOWN CONCENTRATION	LOW MID	ONE PER SAMPLE BATCH
METHOD SPIKE	TO CHECK ACCURACY OF METHOD	SPIKE CLEAN MATRIX BLANK	LOW	ONE PER SAMPLE BATCH
BLIND QUALITY CONTROL CHECK SAMPLES	TO MONITOR LABORATORY PERFORMANCE	ANALYZE AS NORMAL METHOD PROTOCOL SUPPLIED BY CLIENT	LOW MID HIGH	EACH SITE
QUALITY CONTROL CHECK STANDARDS	TO VERIFY EXISTING STANDARD CURVE ON INSTRUMENT	PREPARE FROM SECOND-SOURCE STANDARD	LOW MID HIGH	ONE EVERY 20 SAMPLES AND AFTER RUNNING A NEW CURVE
DUPLICATE SAMPLES	TO CHECK PRECISION OF DATA	PREPARE PER METHOD PROTOCOL	MID	ONE EVERY BATCH
MATRIX SPIKE DUPLICATE	TO CHECK PRECISION OF DATA	SPIKE SAMPLE AND PREPARE PER METHOD PROTOCOL	MID	ONE EVERY BATCH
REAGENT PURITY CHECKS	TO CHECK FOR REAGENT CONTAMINATION	DIRECT INJECTION OF REAGENT INTO ANALYTICAL INSTRUMENT AFTER CONCENTRATION	LOW	AS REQUIRED PER METHOD OR ANALYST

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TABLE 8  
COMMON QA/QC SAMPLES, PROCEDURES AND PREPARATIONS

DESCRIPTION	CONCENTRATION PURPOSE	PROCEDURE	QA SAMPLE LEVEL	CONFIRMATION FREQUENCY
INTERNAL STANDARDS	TO VERIFY INSTRUMENTATION PERFORMANCE	AS PER METHOD	LOW MID	AS REQUIRED PER METHOD OR ANALYST
SURROGATE SPIKES	TO VERIFY INSTRUMENTATION PERFORMANCE	AS PER METHOD	LOW MID	AS REQUIRED PER METHOD OR ANALYST
SPLIT SAMPLES	TO VERIFY LABORATORY PERFORMANCE	AS PER METHOD	LOW MID HIGH	AS REQUIRED BY ANALYST ANALYST OR CLIENT
FIELD BLANKS	TO MONITOR CROSS-CONTAMINATION	AS PER METHOD	LOW MID	EVERY TEN SAMPLES OR ONCE A DAY
EQUIPMENT BLANKS	TO MONITOR EQUIPMENT DECONTAMINATION	AS PER METHOD	LOW MID	EVERY TEN SAMPLES OR ONCE A DAY
TRIP BLANKS	TO MONITOR CROSS-CONTAMINATION	AS PER METHOD	LOW MID	EVERY COOLER UPON TRANSPORTATION

NOTES:

1. A sample batch equals 20 samples or less.
2. Low level is defined as concentrations from the minimum detection limit to a level 5 times the MDL.
3. Mid level is defined as the mean level between the minimum detection level and the upper end of linear range.
4. High level is defined as concentration at the upper end of the linear range.

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## APPENDIX A

TITLE: STANDARD OPERATING PROCEDURES  
FOR HYDRAULIC CONDUCTIVITY OF  
SOLIDIFIED SAMPLES

Department:	Physical Properties
S. O. P. No.	PP-06
Revision No.	0
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## 1.0 SUMMARY

This Standard Operating Procedure (SOP) establishes a standard method for determining the hydraulic conductivity of solidified samples. The procedure is performed in general accordance with American Society of Testing and Materials method ASTM D 5084.

## 2.0 SCOPE

This procedure provides all departments with a method for determining the hydraulic conductivity of solidified samples. The method also addresses equipment calibration and preparation, sample preparation and set up, saturation, consolidation, permeation, sample break-down, data acquisition, equipment cleaning and storage, quality control/assurance, safety and health considerations, and references.

Several terms and symbols are used in this SOP in describing the procedure for conducting hydraulic conductivity testing. The following list gives an explanation of the terms and symbols employed in the procedure.

*N* - Capital letters in bold italics represent panel and permeameter valves as labelled in figure 1.

*vent* - Small letters in underlined italics represent valve positions as labelled in figure 1.

15 - Underlined numbers represent valves as labelled in figure 2.

## 3.0 EQUIPMENT CALIBRATION AND PREPARATION

3.1 The panels are calibrated once every six months.

3.1.1 The volume of water held in the annulus per ml measured on the pipette has been determined for each position on each panel. This was done by filling the annulus with water to the zero mark on the pipette and lowering the water level in the pipette to approximately 24. Then valve *N* was turned to *both* until the water level in the annulus fell by 1 ml as measured by the marks on the pipette (refer to figure 1 for valve and valve position). The amount of water in the annulus, as measured per ml in the pipette, can be read as the amount



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- 3.3.6 Turn valve *D* slowly to vent, thereby releasing the vacuum.
- 3.4 Place the porous stones in a beaker filled with deionized water.
- 3.5 Clean perm cells (perm cells should already be clean) and check pore pressure gauge connections to insure that they are connected with the proper calibrated position on the pore pressure transducer. Information concerning which pore pressure transducer connects to which outlet in the digital readout can be found in the Kiber Equipment Manual.
- 4.0 SAMPLE PREPARATION AND TEST SET UP
- 4.1 Assign a computer tracking code to the sample.
- 4.2 Extrude solidified sample from 3 in x 6 in plastic mold.
- 4.2.1 Cut a small hole in the bottom of the mold with a utility knife.
- 4.2.2 Apply approximately 10 to 30 psi of pressure to the bottom of the sample through the small hole cut in the bottom of the mold. Use a pressure line connected to a down panel or the force drain line.
- 4.2.3 If the sample cannot be extruded using pressure from the panel, cut the bottom of the mold off with a utility knife.
- 4.2.4 Cut the remainder of the mold from the sample being careful not to scar the sides of the sample with the utility knife.
- 4.3 Record the initial conditions of the sample.
- 4.3.1 Trim the top and bottom of the sample equivalent amounts to attain a sample height of 2 to 3 inches (Note: if sample is extremely rigid or contains gravel size particles, cutting the sample to 2 to 3 inches may not be possible, and in this case use the as extruded sample height).
- 4.3.2 Retain the material trimmed in step 4.3.1 and perform a moisture content on this material in accordance with ASTM 2216 and record the data on the permeability set up sheet (page 1).

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- 4.4.9 Fill the chamber with deaired water from 1st position on the panel by turning valve *N* to off, valve *O* to H<sub>2</sub>O, and valve *P* to on. When water begins to come out of the quick connect on top of the chamber, disconnect it and turn valve *P* and *O* to off.
- 4.5 The permeability equipment is supplied with all teflon tubing and steel connections. Still, if the sample is extremely contaminated or a hazardous permeant is to be used for the test, a bladder system arrangement can be implemented to avoid allowing contaminants into the panels. A supplementary SOP explains the procedure for setting up a bladder system.
- 4.6 Bleed the air from the system.
- 4.6.1 To fill the columns, turn valve *N* to both and then valve *O* to H<sub>2</sub>O (be careful not to overfill the columns).
- 4.6.2 Turn the valves on the panel as follows: valve *M* position 1 and 2 to vent, valve *S* to bridge, valve *N* to both for all positions, valve *O* to off for all positions, and valve *P* to on for all positions.
- 4.6.3 Turn the valves on the permeameter as follows: valves 10, 11, 12 and 13 to on (valve is on when turned all the way to the left and off when turned all the way to the right). Then slowly open the pore pressure transducer connected over valves 11 and 13. This is done by unscrewing the top bolt.
- 4.6.4 Open and close valves 11 and 13 letting water flow out of the pore pressure transducer until no air is detected coming from the open pore pressure transducer and no air is visible in any of the system lines (Note: Do not let the pipette or annulus run out of water while bleeding the system of air).
- 4.6.5 Close the pore pressure transducer bolt by screwing down and hand tightening.

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- 5.9 Repeat step 5.8 until the cell pressure reads 47 psi and the back pressure is 45 psi. Check the sample's B value at this point to make sure that the sample is saturated.
- 5.10 When computing the B values for the sample, the saturation data and the sample set up data are input into the permeability spreadsheet (see section 9.0 data acquisition).
- 5.11 If the B value (see section 9.4.4 for the equation) for the sample, as computed by the spreadsheet, reflects that the sample is done saturating (in general  $B > 0.9$  or  $0.95$ ), the engineer in charge will approve the sample for consolidation.

## 6.0 CONSOLIDATION

- 6.1 Turn valve *P* in all positions to off and valve *K* to regulator 1. Raise the cell pressure to 55 psi by turning regulator 1 to the right until the display reads 55. Check that the back pressure is 45 psi by turning valve *K* to regulator 2 (adjust pressure if necessary and recheck cell pressure).
- 6.2 Turn valve *M* in the 1st and 2nd position to vent. Raise the water level in the annulus in all three positions to the zero mark by turning valve *N* to annulus and valve *O* to H<sub>2</sub>O, making sure not to overfill. Lower the water level in the pipettes in the 2nd and 3rd positions until it reads about 20 to 23 ml by turning valve *N* to pipette and valve *O* to drain. Raise the water level in the pipette in the 1st position until it is between about 0 and 5 by turning valve *N* to pipette and valve *O* to H<sub>2</sub>O. Leave valve *N* on pipette for all positions.
- 6.3 Turn valve *M* in the 1st and 2nd position to pressure. Record the time and the water levels in the cell pipette (1st position), the influent pipette (2nd position), and the effluent pipette (3rd position) in the appropriate places on sheet 3 of the data sheets.
- 6.4 Open valve *P* in all positions at the same time and record the water level in all pipettes at 15 seconds, 30 seconds, 1 minute, 2 minutes, 5 minutes, 15 minutes, and 1 hour. Thereafter, resetting the columns may become necessary. Periodically record the water level in all pipettes at 1 to 2 hour intervals.

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- 7.9 Turn valve *P* to on in all positions simultaneously and begin permeation.
- 7.10 Record the time, the date, the tester's initials, the water levels in the pipettes in position 2 and 3, and the regulator pressures at periodic intervals ranging from 10 minutes to several hours depending on how fast the water in the pipettes is moving.
- 7.11 Input the data from 7.10 into the permeability spreadsheet as it is obtained (see section 9.0 for data entry).
- 7.12 At the end of each working day, reset the water levels in positions 2 and 3, turn valve *P* in all positions to off, turn valve *S* to on, and lower the back pressure to 45 psi by turning regulator 2 to the left. Adjust the cell pressure back to 55 psi by turning regulator 1.
- 7.13 In the mornings follow steps 7.1 to 7.7.
- 7.14 When the water levels in the pipettes in positions 2 and 3 are approximately even, reset the water levels as in steps 7.1 to 7.3. Record the time of reset and the new pipette water levels, then reopen valve *P* in all positions and continue permeation as before.
- 7.15 Periodically review the permeability values and the influent/effluent ratios calculated by the spreadsheet for the data input in step 7.11. If the last four perm values computed by the spreadsheet are within 75 % of the average and the influent/effluent ratios are between 0.75 and 1.25 the perm can be considered complete.
- 7.16 Obtain the approval of the engineer in charge prior to termination of permeability testing.

## 8.0 SAMPLE BREAKDOWN

- 8.1 Close valve 12 and 10 on the permeameter by turning the valves all the way to the right.
- 8.2 Turn valve *M* in position 3 to off and turn valve *S* to on.
- 8.3 Lower the pressure in regulator 3 to 0 psi by turning valve *K* to regulator 3

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9.3 Once saturation has been initiated, input sample set up data.

- 9.3.1 The sample set up data is input on page 1 of 6 of the spreadsheet. This includes the three diameters, three heights, the weight, and the moisture content recorded during step 4.2.
- 9.3.2 The spreadsheet automatically calculates the average diameter of the specimen and the average height. Based on these calculations the area, the volume, and the bulk unit weight are automatically computed.
- 9.3.3 The moisture content is computed automatically by the spreadsheet with the input of the weight of the moisture tin, the wet weight of the soil plus the moisture tin, and the dry weight of the soil plus the moisture tin. From this value the initial dry unit weight of the sample is computed by the spreadsheet.

9.4 Input the saturation data as it becomes available.

- 9.4.1 The saturation data is entered on page 2 of 6 of the spreadsheet.
- 9.4.2 The test date, the initials of the technician running the test, the applied cell pressure, the applied back pressure, the saturation pore pressure, and the test pore pressure are input into the spreadsheet.
- 9.4.3 The spreadsheet calculates the change in cell pressure, the change in pore pressure and the B-Value at each point during saturation.
- 9.4.4 The B-Value is computed using the following equation:

$$\frac{CP2 - CP1}{PP2 - PP1}$$

CP1 = Initial Cell Pressure before raising the pressure.

CP2 = New Cell Pressure after the cell pressure has been raised.

PP1 = Initial Pore Pressure.

PP2 = New Pore Pressure.

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- 9.6.4 The equation used by the spreadsheet to calculate the hydraulic conductivity is explained below:

$$k = \frac{al \ln(G_1/G_2)}{2A * 60 * \Delta t}$$

k = Hydraulic conductivity cm/sec

a = Area of pipette cm<sup>2</sup>

l = Length of sample cm

A = Area of sample cm<sup>2</sup>

G<sub>1</sub> = Gradient at time 1

G<sub>2</sub> = Gradient at time 2

- 9.6.5 The average value of the hydraulic conductivity is computed and displayed on the permeability spreadsheet on the summary page.

- 9.7 Input the final data from the breakdown of the sample.

- 9.7.1 The three final diameters and the three final heights measured are input on page 1 of 6 of the spreadsheet. The spreadsheet computes the average final height and final diameter.

- 9.7.2 The final weight and moisture content are entered on page 1 of 6 of the permeability spreadsheet. The final area, volume, bulk unit weight, and dry unit weight are then computed by the spreadsheet.

- 9.8 The summary page of the permeability spreadsheet displays the initial and final dry unit weight and moisture content as well as the average hydraulic conductivity.

## **10.0 EQUIPMENT CLEANUP AND STORAGE**

- 10.1 The O-rings, latex membranes, top platen, and porous stones are decontaminated by thorough washing with a mild Alconox solution.

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### 13.0 REFERENCES

13.1 ASTM D 5084.

13.2 U.S. Army Corp of Engineers Manual EM 1110-2-1906, Appendix VII.

13.3 EPA Method 9100.

## APPENDIX B



## REFERENCES

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12. Department of Environmental Regulation Standard Operating Procedures for Laboratory Operations and Sample Collection Activities, DER QA-001-92, State of Florida QA Section, September 30, 1992.

**APPENDIX B**  
**Accura Quality Assurance Plan**



# Accura Analytical Laboratory, Inc.

## Comprehensive Quality Assurance Plan

01-QS-002.M

Revision 03

Reviewed By:

Thomas L. R. 5/18/98  
Quality Systems Manager Date

Reviewed By:

David J. Miller 5/18/98  
Laboratory Manager Date

Approved By:

J. Shakti Reddy 5/20/98  
Laboratory Director/President Date

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**SECTION 1.0**

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**TITLE PAGE**

**SECTION 2.0**

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**STATEMENT OF POLICY**

## **ACCURA ANALYTICAL LABORATORY'S COMPREHENSIVE QUALITY ASSURANCE PLAN**

The purpose of the Quality Assurance/Quality Control Program at AAL is to provide a system of checks and balances for the production of quality data. The Quality Assurance/Quality Control Program acts as a backup system for the Quality Assurance Manager to assist in ensuring that the environmental program is being conducted according to written communications. The Quality Assurance Plan helps the Quality Assurance Manager to ensure the production of quality data.

The Quality Control Program is setup to regularly monitor the reliability, i.e., precision, accuracy, and reproducibility of reported results. All of the above are measured by the continuous Quality Control Program at Accura Analytical Laboratory, Inc.

## **SECTION 4.0**

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### **ORGANIZATION AND RESPONSIBILITY**

Accura Analytical Laboratory Inc. is a chemical and environmental analytical laboratory committed to providing quality data in the following areas of analytical work

- (1) Metal Analysis
- (2) Organic Analysis
- (3) Inorganic Analysis

Accura Analytical Laboratory Inc. has qualified and experienced personnel.

There are two key functional positions within the organization: (1) Laboratory Manager, and (2) Quality Assurance/Quality Control Manager. Their responsibilities are as follow:

Management Objectives For Quality Assurance/Quality Control

The following management objectives are the basis of the Quality Assurance / Quality Control Program at AAL:

1. Definition of the quality responsibility of personnel and departments
2. Provision of quality assurance guidelines for the acquisition, handling, analysis, verification, and retention of scientific data
3. Application of approved methods of analysis and testing for control of data quality
4. Assurance of standardization and/or control of equipment, instrumentation, standards, reagents, and test materials
5. Assurance of accuracy, precision and reliability of data
6. Interaction with clients; providing of technical assistance
7. Support of the Quality Assurance Program for achievement of these objectives

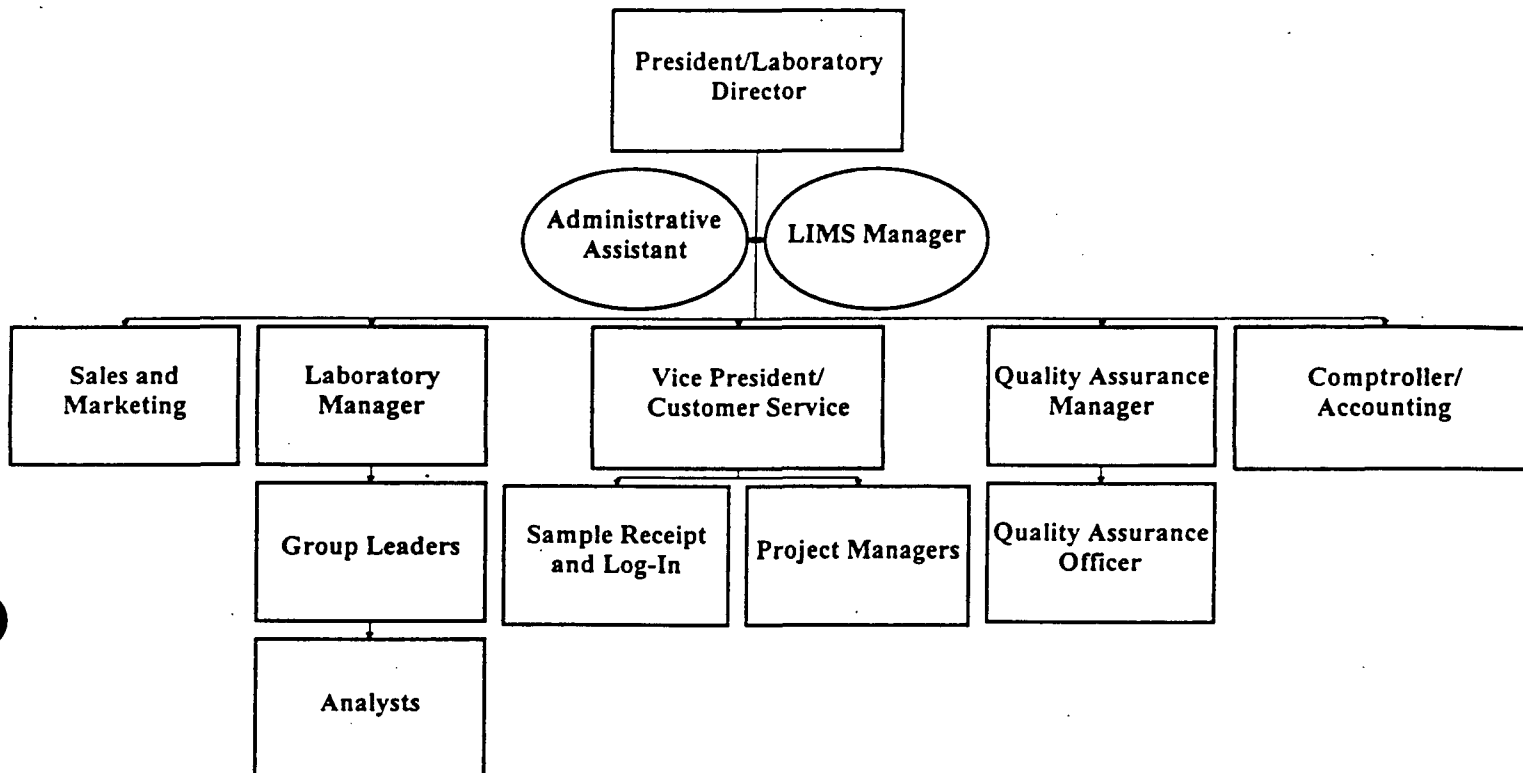
#### Quality Assurance Manager's Responsibilities

1. Implementation of the QA/QC Program
2. Close interaction with Laboratory Manager to implement strong QA/QC program
3. Ensure the maintenance of laboratory records
4. Coordinate the writing and revision of Standard Operating Procedures and in-house QA/QC manuals
5. Schedule and conduct internal and subcontractor audits
6. Participate in audits of AAL by clients and regulatory agencies
7. Development and maintenance of QA/QC Programs
8. Review of all data reports before release to Project Managers
9. Review of laboratory logbooks and maintenance records
10. Preparation and evaluation of blind check samples
11. Revision and update of file holdings

#### Laboratory Manager's Responsibilities

1. Close interaction with QA Manager to implement strong QA/QC program
2. Review of sample log-in information to assure accuracy
3. Scheduling of work load in the laboratory
4. Ensuring that proper protocols are followed by all laboratory staff

**Figure 4.1  
Organization Chart**



### Company Organization and Responsibility

A job description for each person associated with sample collection, sample reception, sample preparation, sample analysis, data reduction, data storage and report preparation is listed below.

**Shaker J.C. Reddy - Laboratory Director / President**

Manages personnel in the laboratory. Oversee the analysis of projects as they pass through the laboratory system. Advise chemist in every phase of the operation of the entire laboratory. Responsible for final decision-making on all laboratory acquisitions and personnel decisions. Coordinates with business development department in the all marketing efforts.

**David C. Fuller - Laboratory Manager / Vice President**

Mr. Fuller is responsible for the day-to-day operations of the laboratory. He coordinates between the project managers, quality systems personnel and analysts to ensure smooth operations and the maximum efficiency of equipment and rapid and accurate analysis. He also advises customers of EPA protocol with regards to sampling requirements, preservation and holding times.

**Thomas G. Lee - Quality Systems Manager/Radiation Safety Manager**

Mr. Lee is responsible for the management of the Quality Assurance/Quality Control Program for the laboratory. His duties include the overall quality control checks on laboratory procedures and methods. As Quality Systems Manager, he oversees the verification and maintenance of quality data that is generated by the analyst and reported to the client. He is responsible for document control and development of Standard Operating Procedures. As Radiation Safety Manager, Mr. Lee is responsible for radiation safety and adhering to the Radioactive Materials License. He is also responsible for the Chemical, Safety and Hygiene Program and coordinates all safety and training meetings for all employees.

**Linda Dahlgren - Quality Assurance Officer**

Ms. Dahlgren is responsible for reviewing data and assuring quality data is generated by the analyst and reported to the client. She gives final quality control approval on all projects. This includes such tasks as sending blind quality control performance evaluation samples through AAL's normal chain of procedures, reviewing sample duplicates, matrix spikes and matrix spike duplicates, evaluating laboratory blank results and ensuring that daily calibration requirements have been met for the analysis.

**Adrian Smith - Quality Assurance Officer**

Ms. Smith is responsible for the quality control review of analytical data performed by AAL analysts. She reviews data received from subcontract laboratories. She looks at all relative QC requirements and makes the proper recommendations. She gives final quality control approval on all projects.

**Kelly Clemons - Quality Assurance Audit Coordinator**

Ms. Clemons coordinates all laboratory information for both internal and external audits. She writes and reviews Standard Operating Procedures used in the laboratory. She updates procedures according to changes in EPA methods. She works closely with quality assurance officers and the analysts regarding the necessary information required for upcoming audits.

**Lynn Moody - Project Manager**

Ms. Moody is responsible for coordination and communication of clients' analytical needs to the laboratory personnel. She reviews each client's request when received at the laboratory and gives final management approval to projects before they are forwarded to the client. Ms. Moody can provide backup for BTEX, GRO, DRO analysis as well as providing Electronic Data Deliverables for clients.

### **Company Organization and Responsibility (continued)**

**Jim Reisch - Project Manager**

Mr. Reisch's position as project manager allows him direct contact with clients to assure the laboratory meets the clients' requests for service. He communicates with each contact regarding analysis to be completed by the laboratory. He reviews the log-in procedure and the completed projects prior to their being sent to clients.

**Martin Van Lear - Business Development**

Mr. Van Lear is responsible for establishing and maintaining accounts with clients. This includes customer assistance, project bids, and other marketing duties. Mr. Van Lear works closely with the project managers in work load scheduling.

**Carol McPherson - Business Development/Project Manager**

Ms. McPherson is responsible for actively developing client contacts for the laboratory. She works closely with the U.S. Navy and AFCEE personnel regarding upcoming projects. Ms. McPherson assists in the project management with projects needing special attention.

**John Bates - Business Development**

Mr. Bates assists in the marketing efforts of the lab through making new contacts with Department of Defense contractors. He assists in the Materials, Control and Accountability functions for the laboratory.

**Brittany Wade - Sample Shipping and Receiving**

Ms. Wade is responsible for receiving and logging in samples as the samples arrive at the laboratory. She verifies sample information as recorded on the client's chain-of-custody and assigns each sample a unique tracking number that is used to identify the client, describes the samples and details the analytical work to be performed. Ms. Wade also checks and records temperature, pH of samples and other sample preservation requirements.

**Michael Patterson - Sample Shipping and Receiving**

Mr. Patterson is responsible for the picking up of samples from sites and delivering them to the laboratory. He also assists in the receiving and logging in of samples. He verifies sample information as recorded on the client's chain-of-custody and assigns each sample a unique tracking number that is used to identify the client, describes the samples and details the analytical work to be performed. Mr. Patterson also checks and records the temperature, pH of samples and other sample preservation requirements.

**Marcie Ergle - Administrative Section**

Ms. Ergle is responsible for reducing chemist's data from the work sheets into a final LIMS report format that will be sent to the client.

**Maria Gonzalez - Administrative Section**

Ms. Gonzalez is responsible for reducing chemist's data from the work sheets into a final LIMS report format that will be sent to the client. She also assists with general administrative duties.

**Gayle Lorton - Administrative Section**

Ms. Lorton is responsible for answer client questions or directing them to the proper individual for assistance. She is also responsible for invoicing, maintaining client records, and collecting client accounts in close association with the company accountant. Further, she is responsible for all insurance questions and is the company liaison with our insurance carriers.



### Company Organization and Responsibility (continued)

**Vinod Reddy - Comptroller/Accountant**

Mr. Reddy is responsible for the financial affairs of the company. Duties include payroll, accounts payable and receivable.

**Chen Zhang - Organics GC\MS, Group Leader**

Mr. Zhang is responsible for the analysis of Volatile Organic Compounds by EPA Methods. He maintains accurate sample run logs, standard preparation logs and quality control batch files of all QC data generated. He also assists in BTEX, GRO and DRO analyses, as well as the analysis of Semi-Volatile Organic Compounds.

**Anthony Gatch - Organics GC\MS**

Mr. Gatch is responsible for the analysis of Volatile Organic Compounds by EPA Methods. He maintains accurate sample run logs, standard preparation logs and quality control batch files of all QC data generated. He also assists in BTEX analyses.

**Duane Johnson - Organics GC/MS**

Mr. Johnson is responsible for the analysis of Volatile Organic Compounds by EPA Methods. He maintains accurate sample run logs, standard preparation logs and quality control batch files of all QC data generated.

**Jeff Wilmoth - Organics GC\MS, Group Leader**

Mr. Wilmoth is responsible for the analysis of Semi-Volatile Organic Compounds by EPA Methods. He is also responsible for checking the extraction department's efficiency and promptness of quality related data. He maintains all appropriate standard preparation logs, GC/MS maintenance logs, and other record keeping and quality related functions.

**John Peterson - Organics GC/MS**

Mr. Peterson is responsible for the operation of gas chromatographs/mass spectrometry for semi-volatile organic compounds utilizing standard EPA Methods and techniques. He is responsible for reporting the data for samples tested.

**Yefim Kerzhner - Organics GC\ECD**

Mr. Kerzhner is responsible for the analysis of Pesticides, Herbicides, and PCBs by EPA Methods. He is also responsible for any miscellaneous work that might be performed by GC/ECD. He is responsible for checking the extraction department's efficiency through various QC methods. He maintains all appropriate standard preparation logs, GC maintenance logs, miscellaneous sample preparation logs and quality control batch files. He also assists in GC/FID organic analysis.

**Kim Jackson - Organics GC\PID\FID**

Ms. Jackson is responsible for the analysis of Volatile Organic Compounds by EPA Methods. She is also responsible for Gasoline Range Organics by Tennessee UST methods. She maintains accurate sample run logs, standard preparation logs and quality control batch files of all QC data generated.

**Scott Dixon - Organics GC/FID**

Mr. Dixon is responsible for the analysis of Diesel Range Organics by Tennessee, Florida and EPA methods, as well as the analysis of Total Petroleum Hydrocarbons by EPA methodology. He maintains detailed logbooks for information relevant to the analysis.

### Company Organization and Responsibility (continued)

**Joe Konopski - Organic Extractions, Group Leader**

Mr. Konopski is responsible for the sample extraction process of the Organic section of the laboratory. He routinely performs extractions for Base-Neutral and Acid Extractables, Pesticides, PCBs, Herbicides, and DROs. He follows the guidelines for good laboratory practices and maintains detailed extraction logbooks for information relevant for each sample extracted.

**Brian Burns - Organic Extractions**

Mr. Burns is responsible for the sample extractions by EPA Organic Methods. He performs the necessary extractions for Semi-Volatile, DRO, Pesticide, PCB and Herbicide samples.

**Michael Trinidad - Organic Extractions/Sample Shipping and Receiving**

Mr. Trinidad is responsible for sample extraction for organics following EPA Methods. He also assists in receiving and logging in samples as the samples arrive at the laboratory. He verifies sample information as recorded on the client's chain-of-custody and assigns each sample a unique tracking number that is used to identify the client, describes the samples and details the analytical work to be performed. Mr. Trinidad has received 40-Hour OSHA training.

**Sean Hyde - Inorganics/Metals, Group Leader**

Mr. Hyde is responsible for the daily functions of the Metals and Wet Chemistry Departments. He ensures that good laboratory practices are followed in the sample preparation and analysis for all metal and wet chemistry analyses. He also assists in the maintenance of laboratory equipment. He maintains all necessary logbooks and all associated quality control data required by the various methods.

**Chris Murphy - Metals**

Mr. Murphy is responsible for the analysis of samples for Mercury by cold vapor AA and assists in metal digestions and other inorganic analyses. He maintains all necessary logbooks and all associated quality control data required by the various methods.

**Craig Scott - Metals**

Mr. Scott is responsible for the daily analysis of metals by ICP and AA Furnace. He maintains all necessary metals logbooks and all associated quality control data required.

**Ralph Lindsey - Inorganics**

Mr. Lindsey is responsible for wet chemistry analysis including cyanide, oil and grease, TKN, sulfate and phosphates. He also coordinates special projects for the laboratory.

**Greg McTure - Inorganics**

Mr. McTure is responsible for all inorganic non-metal analysis such as Cyanides, Phenols, pH, Chlorides, Hazscans, Paint Filter, Flashpoint, TPH, Oil and Grease, by the appropriate EPA Methods and metals digestions and TCLP extractions. He maintains accurate sample run logs, miscellaneous sample preparation logs and all necessary quality control data.

**Samantha Runge - Inorganics**

Ms. Runge is responsible for the daily analyses in the wet chemistry portion of the laboratory. These analyses include Cyanides, Phenols, pH, TPH, Oil and Grease, etc. by the appropriate EPA Methods, as well as TCLP extractions. She maintains accurate sample run logs, miscellaneous sample preparation logs and all necessary quality control data.

## 4.1 Fields of Expertise

KEY PERSONNEL	POSITION / TITLE	FIELD OF EXPERTISE																										
		EDUCATION	TOTAL YEARS OF EXPERIENCE		YEARS WITH ACCURA LABS		MANAGEMENT	QA/QC	HEALTH AND SAFETY	SAMPLE MANAGEMENT	DATA VALIDATION	SAMPLE PREPARATION (Organics)	VOLATILE ORGANIC ANALYSIS (GC/MS)		SEMI-VOLATILE ANALYSIS (GC/MS)	VOLATILE ORGANIC ANALYSIS (GC)		PESTICIDES - PCB's (GC)	TPH / IR SPECTROSCOPY	SAMPLE PREPARATION (Inorganics)	METALS: FLAME/FURNACE		ICP	MERCURY AA-CV	CYANIDE UV-VIS	GENERAL WET CHEMISTRY	TCLP EXTRACTION	
Shaker Reddy	Lab Director	MS	13	10	X	X							X	X				X	X									
David Fuller	Laboratory Manager	BS	13	7	X	X			X																			
Thomas Lee	Quality Systems Manager	BS	23	1	X	X	X	X		X																		
Linda Dahlgren	Quality Officer	BS	6	1	X	X	X			X	X					X	X			X			X	X		X	X	
Adrian Smith	Quality Officer	BA	3	1	X	X				X	X					X	X			X	X		X	X		X	X	
Lynn Moody	Project Manager (PM)	BS	3	3	X	X			X		X					X			X							X		
Jim Reisch	Project Manager (PM)	BS	3	1	X	X			X		X					X						X						
Martin Van Lear	PM/ Business Develop.	BS	3	3	X				X																			
Jeffrey Wilmoth	Semi-Voc. Group Leader	BS	6	3	X	X				X	X	X	X	X	X	X										X	X	
John Peterson	Organic Chemist-GCMS	BS	2	1							X	X	X	X	X	X	X											
Yefim Kerzhner	Organic Chemist-GC	MS	19	1							X	X	X	X	X	X	X											
Chen Zang	Volatiles Group Leader	PE	16	1	X	X					X	X	X	X	X	X												
Thomas A. Gatch	Organic Chemist-GCMS	BS	16	1					X	X	X	X	X	X	X	X												
Duane Johnson	Organic Chemist-GCMS	BS	4	1							X	X	X	X	X	X												
Kim Jackson	Organic Chemist-GC	BS	2	1												X				X						X	X	
Scott Dixon	Lab Technician	BS	2	2							X					X	X			X						X	X	
Sean Hyde	Inorganic Group Leader	BS	6	3	X	X				X										X	X	X				X	X	
Craig Scott	Metals Analyst	BS	6	1																	X					X		
Chris Murphy	Lab Technician	BS	1	1																X				X		X		
Samantha Runge	Lab Technician	BS	1	1																X					X	X	X	
Ralph Lindsey	Lab Technician	BS	2	1																X					X	X	X	
Greg McTure	Lab Technician	BS	1	1																X					X	X	X	
Joseph Konopski	Extractions Group Leader	BA	7	1	X	X				X	X																	
Brian G. Burns	Lab Technician	BS	1	1							X															X		
Michael Trinidad	Sample Receiving	BS	1	1					X		X																	
Mike Patterson	Sample Receiving	HS	1	1					X																			
Brittany Wade	Sample Receiving	BS	1	1					X																			

\*\* This list does not include any personnel from report generation, office management and support, and accounting/finance offices.

## **SECTION 5.0**

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### **QA / QC TARGETS FOR PRECISION, ACCURACY AND METHOD DETECTION LIMITS**

## SAMPLE PREPARATION METHODS

The Following EPA procedures are used in the preparation of samples.

**TABLE 5.1**  
**SAMPLE EXTRACTION, PREPARATION AND CLEANUP METHODOLOGY**

SAMPLE PREPARATION METHOD #	DESCRIPTION	MATRIX	SAMPLE PREP FOR THE FOLLOWING METHODS
200.7	Acid Digestion	All	200.7, 6010B
200.9	Acid Digestion	Water	200.9
245.1, 7470	Mercury Digestion	Water & Aqueous	245.1, 7470
245.5, 7471	Mercury Digestion	Solids, Soils & Sludges	245.5, 7471
608	Separatory Funnel Liq./Liq. Extraction	Water & Aqueous	608
615	Separatory Funnel Liq./Liq. Extraction	Water & Aqueous	615
8151A	Soxhlet Extraction Ultrasonic Extraction	Solids, Soils & Sludges	8151A
625	Separatory Funnel Liq./Liq. Extraction	Water & Aqueous	625
3510C	Separatory Funnel Liq./Liq. Extraction	Water & Sludges	8081A, 8082, 8270C, DRO
3520C	Continuous Liq./Liq. Extraction	Water & Sludges	8081A, 8082, 8270C
3540C	Soxhlet Extraction	Solids, Soils & Sludges	8081A, 8082, 8270C, DRO
3550B	Ultrasonic Extraction	Solids & Soils	8081A, 8082, 8270C, DRO
3580A	Waste Dilution	Oils & Neat Products	8081A, 8082, 8151A, 8270C
3620B	Florisil Cleanup	All	608, 8081A, 8082, 615, 8151A
3630C	Silica Gel Cleanup	All	625, 8270C
3660B	Sulfur Cleanup	All	608, 8081A, 8082
3665A	Sulfuric Acid Cleanup	All	608 - PCBs only, 8082
5030B	Purge & Trap	All	602, 8021, 624, 8260B
5035	Closed System P&T	Solids & Soils	602, 8021, 624, 8260B
8011	Microextraction	Water & Aqueous	8011
1310A	EP-TOX Extraction	Solids, Soils, Sludges	200.7, 6010B, 7470A, 8081A, 8082, 8151A, 8260B, 8270C
1311	TCLP Extraction	Solids, Soils, Sludges	200.7, 6010B, 7470A, 8081A, 8082, 8151, 8260B, 8270C
1320	Multiple Extraction	Solids, Soils, Sludges	200.7, 6010B, 7470A, 8081A, 8082, 8151, 8260B, 8270C

Table 5.2

## QUALITY ASSURANCE OBJECTIVES

<i>PARAMETER</i>	<i>Method Reference</i>	<i>Matrix</i>	<i>Precision % RPD</i>	<i>Conc. Range</i>	<i>Accuracy % Recovery</i>	<i>Conc. Range</i>	<i>Method (1) Detection Limit</i>
<b>Metals-ICP</b>	<i>Reference **</i>						(mg/L)
Aluminum	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.0050
Antimony	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.014
Arsenic	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.010
Barium	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.0010
Beryllium	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.00020
Cadmium	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.00090
Calcium	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.033
Chromium	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.0020
Cobalt	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.0010
Copper	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.0020
Iron	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.012
Lead	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.012
Magnesium	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.015
Manganese	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.0013
Nickel	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.0020
Potassium	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.047
Selenium	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.028
Silver	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.0020
Sodium	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.013
Thallium	200.7, 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.052

(1) MDL's have been based on the EPA method of determining method detection limits.

\*\* EPA approved methods from SW846 series and EPA 200 series.

^^ QA targets derived from internal goals.

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Table 5.2

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

<i>PARAMETER</i>	<i>Method Reference</i>	<i>Matrix</i>	<i>Precision % RPD</i>	<i>Conc. Range</i>	<i>Accuracy % Recovery</i>	<i>Conc. Range</i>	<i>Method (1) Detection Limit</i>
<b>Metals-ICP (Cont'd)</b>	<i>Reference **</i>						(mg/L)
Tin	200.7 , 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.028
Vanadium	200.7 , 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.014
Zinc	200.7 , 6010B	SW,GW,Eff	20	L	75 - 125 ^^	L	0.0010
<b>Metals-Cold Vapor</b>							(ug/L)
Mercury	245.1 , 7470A	SW,GW,Eff	20	L	75 - 125 ^^	L	0.30
							(ug/Kg)
Mercury	245.5 , 7471A	HW,Sed,S	20	L	75 - 125 ^^	L	22
<b>Graphite Furnace - AA</b>							(ug/L)
Antimony	200.9 , 7041	SW,GW,Eff	20	L	75 - 125 ^^	L	3.6
Lead	200.9 , 7421	SW,GW,Eff	20	L	75 - 125 ^^	L	0.42
Thallium	200.9 , 7841	SW,GW,Eff	20	L	75 - 125 ^^	L	1.4

(1) MDL's have been based on the EPA method of determining method detection limits

^^ QA targets derived from internal goals

\*\* EPA approved methods from SW846 series and EPA 200 series

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## QUALITY ASSURANCE OBJECTIVES

<i>PARAMETER</i>	<i>Method Reference</i>	<i>Matrix</i>	<i>Precision % RPD</i>	<i>Conc. Range</i>	<i>Accuracy % Recovery</i>	<i>Conc. Range</i>	<i>Method (1) Detection Limit</i>
<b>Metals-ICP</b>	<i>Reference **</i>						<b>(mg/Kg)</b>
Aluminum	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	6.0
Antimony	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	1.3
Arsenic	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	0.98
Barium	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	0.19
Beryllium	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	0.080
Cadmium	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	0.13
Calcium	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	3.8
Chromium	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	0.24
Cobalt	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	0.10
Copper	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	0.27
Iron	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	37
Lead	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	1.5
Magnesium	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	1.4
Manganese	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	0.81
Nickel	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	0.32
Potassium	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	5.0
Selenium	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	2.4
Silver	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	0.12
Sodium	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	6.5
Thallium	200.7, 6010B	HW,Sed,S	20	L	75 - 125 ^^	L	2.1

(1) MDL's have been based on the EPA method of determining method detection limits.

\*\* EPA approved methods from SW846 series and EPA 200 series.

^^ QA targets derived from internal goals

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Table 5.2

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

[illegible]

(1) MDL's have been based on the EPA method of determining method detection limits.

QA targets derived from internal goals.

\*\* EPA approved methods from SW846 series and EPA 200 series.

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Table 5.2

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

<i>PARAMETER</i>	<i>Method Reference</i>	<i>Matrix</i>	<i>Precision % RPD</i>	<i>Conc. Range</i>	<i>Accuracy % Recovery</i>	<i>Conc. Range</i>	<i>Method (1) Detection Limit</i>
<b>Pesticides</b>	<i>Reference **</i>						<b>(ug/L)</b>
Aldrin	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.022
alpha-BHC	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.038
beta-BHC	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.023
delta-BHC	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.038
gamma-BHC (Lindane)	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.043
Chlordane (technical)	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.33
4,4-DDD	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.039
4,4-DDE	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.027
4,4-DDT	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.035
Dieldrin	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.036
Endosulfan I	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.045
Endosulfan II	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.080
Endosulfan Sulfate	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.027
Endrin	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.036
Endrin Aldehyde	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.049
Heptachlor	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.044
Heptachlor Epoxide	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.022
Methoxychlor	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.054
Toxaphene	608 , 8081A	SW,GW,EF	20	L	75 - 125 ^	L	0.47

(1) MDL's have been based on the EPA method of determining method detection limits.

^ QA targets derived from internal goals.

v A method validation study is needed for these compounds

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Table 5.2

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

<i>PARAMETER</i>	<i>Method Reference</i>	<i>Matrix</i>	<i>Precision % RPD</i>	<i>Conc. Range</i>	<i>Accuracy % Recovery</i>	<i>Conc. Range</i>	<i>Method (1) Detection Limit</i>
<b>Pesticides (Cont'd)</b>							<b>(ug/Kg)</b>
Aldrin	8081A	HW,SED,S	20	L	75 - 125 ^^	L	1.4
alpha-BHC	8081A	HW,SED,S	20	L	75 - 125 ^^	L	1.6
beta-BHC	8081A	HW,SED,S	20	L	75 - 125 ^^	L	1.0
delta-BHC	8081A	HW,SED,S	20	L	75 - 125 ^^	L	0.92
gamma-BHC (Lindane)	8081A	HW,SED,S	20	L	75 - 125 ^^	L	1.5
Chlordane (technical)	8081A	HW,SED,S	20	L	75 - 125 ^^	L	7.4
4,4-DDD	8081A	HW,SED,S	20	L	75 - 125 ^^	L	0.90
4,4-DDE	8081A	HW,SED,S	20	L	75 - 125 ^^	L	1.0
4,4-DDT	8081A	HW,SED,S	20	L	75 - 125 ^^	L	0.85
Dieldrin	8081A	HW,SED,S	20	L	75 - 125 ^^	L	0.89
Endosulfan I	8081A	HW,SED,S	20	L	75 - 125 ^^	L	0.88
Endosulfan II	8081A	HW,SED,S	20	L	75 - 125 ^^	L	1.0
Endosulfan Sulfate	8081A	HW,SED,S	20	L	75 - 125 ^^	L	2.1
Endrin	8081A	HW,SED,S	20	L	75 - 125 ^^	L	0.86
Endrin Aldehyde	8081A	HW,SED,S	20	L	75 - 125 ^^	L	1.1
Heptachlor	8081A	HW,SED,S	20	L	75 - 125 ^^	L	1.8
Heptachlor Epoxide	8081A	HW,SED,S	20	L	75 - 125 ^^	L	0.95
Methoxychlor	8081A	HW,SED,S	20	L	75 - 125 ^^	L	1.2
Toxaphene	8081A	HW,SED,S	20	L	75 - 125 ^^	L	17

- (1) MDL's have been based on the EPA method of determining method detection limits.  
 ~ QA targets derived from internal goals.  
 \*\* EPA approved methods from SW-846 or CFR

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Table 5.2

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

<i>PARAMETER</i>	<i>Method Reference</i>	<i>Matrix</i>	<i>Precision % RPD</i>	<i>Conc. Range</i>	<i>Accuracy % Recovery</i>	<i>Conc. Range</i>	<i>Method (I) Detection Limit</i>
<b>PCBs</b>							<b>(ug/L)</b>
Aroclor - 1016	608,8082	SW,GW,Eff	20	L	75 - 125 ^^	L	0.56
Aroclor - 1221	608,8082	SW,GW,Eff	20	L	75 - 125 ^^	L	1.0
Aroclor - 1232	608,8082	SW,GW,Eff	20	L	75 - 125 ^^	L	0.40
Aroclor - 1242	608,8082	SW,GW,Eff	20	L	75 - 125 ^^	L	0.53
Aroclor - 1248	608,8082	SW,GW,Eff	20	L	75 - 125 ^^	L	0.15
Aroclor - 1254	608,8082	SW,GW,Eff	20	L	75 - 125 ^^	L	0.36
Aroclor - 1260	608,8082	SW,GW,Eff	20	L	75 - 125 ^^	L	0.51
<b>PCBs</b>							<b>(ug/Kg)</b>
Aroclor - 1016	8082	HW,SED,S	20	L	75 - 125 ^^	L	7.9
Aroclor - 1221	8082	HW,SED,S	20	L	75 - 125 ^^	L	22
Aroclor - 1232	8082	HW,SED,S	20	L	75 - 125 ^^	L	17
Aroclor - 1242	8082	HW,SED,S	20	L	75 - 125 ^^	L	8.3
Aroclor - 1248	8082	HW,SED,S	20	L	75 - 125 ^^	L	7.5
Aroclor - 1254	8082	HW,SED,S	20	L	75 - 125 ^^	L	6.8
Aroclor - 1260	8082	HW,SED,S	20	L	75 - 125 ^^	L	13
<b>Deisel Range Organics</b>							<b>(ug/L)</b>
DRO	8015M	SW,GW,Eff	20	L	75 - 125 ^^	L	13
<b>Deisel Range Organics</b>							<b>(ug/Kg)</b>
DRO	8015M	HW,SED,S	20	L	75 - 125 ^^	L	16

Table 5.2

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

<i>PARAMETER</i>	<i>Method Reference</i>	<i>Matrix</i>	<i>Precision % RPD</i>	<i>Conc. Range</i>	<i>Accuracy % Recovery</i>	<i>Conc. Range</i>	<i>Method (1) Detection Limit</i>
<b>Herbicides</b>							<b>(ug/L)</b>
2,4-D	615 , 8151A	SW,GW,Eff	25 ^^	L	75 - 125 ^^	L	0.22
2,4-DB	615 , 8151A	SW,GW,Eff	25 ^^	L	75 - 125 ^^	L	0.20^^
2,4-DP (Dichloroprop)	615 , 8151A	SW,GW,Eff	25 ^^	L	75 - 125 ^^	L	0.20^^
2,4,5-TP (Silvex)	615 , 8151A	SW,GW,Eff	25 ^^	L	75 - 125 ^^	L	0.30
2,4,5-T	615 , 8151A	SW,GW,Eff	25 ^^	L	75 - 125 ^^	L	0.27
Dalapon	615 , 8151A	SW,GW,Eff	25 ^^	L	75 - 125 ^^	L	0.20^^
Dicamba	615 , 8151A	SW,GW,Eff	25 ^^	L	75 - 125 ^^	L	0.05^^
Dinoseb	615 , 8151A	SW,GW,Eff	25 ^^	L	75 - 125 ^^	L	0.20^^
MCPA	615 , 8151A	SW,GW,Eff	25 ^^	L	75 - 125 ^^	L	50.0^^
MCP	615 , 8151A	SW,GW,Eff	25 ^^	L	75 - 125 ^^	L	50.0^^
<b>Herbicides</b>							<b>(ug/Kg)</b>
2,4-D	8151A	HW,SED,S	25 ^^	L	75 - 125 ^^	L	5.0
2,4-DB	8151A	HW,SED,S	25 ^^	L	75 - 125 ^^	L	4.0^^
2,4-DP (Dichloroprop)	8151A	HW,SED,S	25 ^^	L	75 - 125 ^^	L	4.0^^
2,4,5-TP (Silvex)	8151A	HW,SED,S	25 ^^	L	75 - 125 ^^	L	7.0
2,4,5-T	8151A	HW,SED,S	25 ^^	L	75 - 125 ^^	L	13
Dalapon	8151A	HW,SED,S	25 ^^	L	75 - 125 ^^	L	4.0^^
Dicamba	8151A	HW,SED,S	25 ^^	L	75 - 125 ^^	L	1.0^^
Dinoseb	8151A	HW,SED,S	25 ^^	L	75 - 125 ^^	L	4.0^^
MCPA	8151A	HW,SED,S	25 ^^	L	75 - 125 ^^	L	1000^^
MCP	8151A	HW,SED,S	25 ^^	L	75 - 125 ^^	L	1000^^

- (1) MDL's have been based on the EPA method of determining method detection limits.  
 ^^ QA targets derived from internal goals.

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Table 5.2

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

PARAMETER	Method Reference	Matrix	Precision % RPD	Conc. Range	Accuracy % Recovery	Conc. Range	Method (1) Detection Limit
<b>Volatiles</b>							(ug/l.)
Acetone	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	1.1
Acrolein	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	1.2
Acrylonitrile	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	0.89
Benzene	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	1.0
Bromobenzene	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	0.65
Bromochloromethane	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	0.89
Bromodichloromethane	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	1.1
Bromoform	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	0.99
Bromomethane	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	2.1
2-Butanone	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	1.4
Carbon disulfide	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	1.4
Carbon tetrachloride	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	2.4
Chlorobenzene	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	1.1
Chloroethane	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	2.6
2-Chloroethyl vinyl ether	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	0.75
2-Chlorotoluene	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	1.3
4-Chlorotoluene	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	1.3
Chloroform	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	0.96
Chloromethane	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	0.88
Dibromochloromethane	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	1.1
1,2-Dibromo-3-chloropropane	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	0.77
Dibromomethane	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	0.98
1,2-Dichlorobenzene	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	1.2
1,3-Dichlorobenzene	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	1.2
1,4-Dichlorobenzene	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	1.2
Dichlorodifluoromethane	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	0.85
1,1-Dichloroethane	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	1.1
1,2-Dichloroethane	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	0.86
1,1-Dichloroethene	624 / 8260B	SW,GW,Eff	20	L	75 - 120 <sup>^^</sup>	L	1.1

(1) MDL's have been based on the EPA method of determining method detection limits  
 ^^ QA targets derived from internal goals  
 v A method validation study is needed for these compounds.

Table 5.2

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

PARAMETER	Method Reference	Matrix	Precision % RPD	Conc. Range	Accuracy % Recovery	Conc. Range	Method (1) Detection Limit
<b>Volatiles (Cont'd)</b>							(ug/L)
cis-1,2-Dichloroethene	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	0.93
trans-1,2-Dichloroethene	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	0.97
1,2-Dichloropropane	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	1.0
cis-1,3-Dichloropropene	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	1.1
trans-1,3-Dichloropropene	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	1.0
Ethyl benzene	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	1.2
Hexachlorobutadiene	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	1.5
2-Hexanone	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	1.3
Methylene chloride	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	0.94
4-Methyl-2-Pentanone	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	1.1
Methyl Tert Butyl Ether (MTBE)	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	0.93
Styrene	624 / 8260B	SW,GW,Eff	20	L	60 - 125^^	L	1.1
1,1,2,2-Tetrachloroethane	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	1.1
Tetrachloroethene	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	1.8
Toluene	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	1.0
1,2,3-Trichlorobenzene	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	1.1
1,2,4-Trichlorobenzene	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	1.0
1,1,1-Trichloroethane	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	1.0
1,1,2-Trichloroethane	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	0.99
Trichloroethene	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	0.90
Trichlorofluoromethane	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	1.2
1,3,5-Trimethylbenzene	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	1.2
Vinyl chloride	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	0.88
m,p-Xylene	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	2.2
o-Xylene	624 / 8260B	SW,GW,Eff	20	L	75 - 120^^	L	1.0

(1) MDL's have been based on the EPA method of determining method detection limits.

^^ QA targets derived from internal goals.

v A method validation study is needed for these compounds.

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Table 5.2

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

PARAMETER	Method Reference	Matrix	Precision % RPD	Conc. Range	Accuracy % Recovery	Conc. Range	Method (1) Detection Limit
<b>Volatiles</b>							(ug/Kg)
Acetone	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	10
Acrolein	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	1.9
Acrylonitrile	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	4.3
Benzene	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.59
Bromobenzene	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.30
Bromochloromethane	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.29
Bromodichloromethane	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.28
Bromoform	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.35
Bromomethane	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	2.2
2-Butanone	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	5.3
Carbon disulfide	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.32
Carbon tetrachloride	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.23
Chlorobenzene	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.19
Chloroethane	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	2.9
2-Chloroethyl vinyl ether	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	2.1
2-Chlorotoluene	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.26
4-Chlorotoluene	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.44
Chloroform	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.17
Chloromethane	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.77
Dibromochloromethane	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.15
1,2-Dibromo-3-chloropropane	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	3.3
Dibromomethane	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.30
1,2-Dichlorobenzene	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.36
1,3-Dichlorobenzene	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.36
1,4-Dichlorobenzene	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.23
Dichlorodifluoromethane	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.36
1,1-Dichloroethane	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.17
1,2-Dichloroethane	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.21
1,1-Dichloroethene	8260B	HW,SED,S	20	L	75 - 120 <sup>^^</sup>	L	0.34

(1) MDL's have been based on the EPA method of determining method detection limits.  
<sup>^^</sup> QA targets derived from internal goals.  
<sup>v</sup> A method validation study is needed for these compounds.



Table 5.2

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

PARAMETER	Method Reference	Matrix	Precision % RPD	Conc. Range	Accuracy % Recovery	Conc. Range	Method (1) Detection Limit
<b>Volatiles (Cont'd)</b>							(ug/Kg)
cis-1,2-Dichloroethene	8260B	HW,SED,S	20	L	75 - 120^^	L	0.23
trans-1,2-Dichloroethene	8260B	HW,SED,S	20	L	75 - 120^^	L	0.24
1,2-Dichloropropane	8260B	HW,SED,S	20	L	75 - 120^^	L	0.14
cis-1,3-Dichloropropene	8260B	HW,SED,S	20	L	60 - 125^^	L	0.24
trans-1,3-Dichloropropene	8260B	HW,SED,S	20	L	75 - 120^^	L	0.25
Ethyl benzene	8260B	HW,SED,S	20	L	75 - 120^^	L	0.19
Hexachlorobutadiene	8260B	HW,SED,S	20	L	75 - 120^^	L	1.5
2-Hexanone	8260B	HW,SED,S	20	L	75 - 120^^	L	4.2
Methylene chloride	8260B	HW,SED,S	20	L	75 - 120^^	L	0.39
4-Methyl-2-Pentanone	8260B	HW,SED,S	20	L	75 - 120^^	L	3.7
Methyl Tert Butyl Ether (MTBE)	8260B	HW,SED,S	20	L	75 - 120^^	L	0.23
Styrene	8260B	HW,SED,S	20	L	75 - 120^^	L	0.15
1,1,2,2-Tetrachloroethane	8260B	HW,SED,S	20	L	75 - 120^^	L	0.84
Tetrachloroethene	8260B	HW,SED,S	20	L	75 - 120^^	L	0.38
Toluene	8260B	HW,SED,S	20	L	75 - 120^^	L	0.17
1,2,3-Trichlorobenzene	8260B	HW,SED,S	20	L	75 - 120^^	L	1.2
1,2,4-Trichlorobenzene	8260B	HW,SED,S	20	L	75 - 120^^	L	1.1
1,1,1-Trichloroethane	8260B	HW,SED,S	20	L	75 - 120^^	L	0.20
1,1,2-Trichloroethane	8260B	HW,SED,S	20	L	75 - 120^^	L	0.28
Trichloroethene	8260B	HW,SED,S	20	L	75 - 120^^	L	0.34
Trichlorofluoromethane	8260B	HW,SED,S	20	L	75 - 120^^	L	0.57
1,3,5-Trimethylbenzene	8260B	HW,SED,S	20	L	75 - 120^^	L	0.25
Vinyl chloride	8260B	HW,SED,S	20	L	75 - 120^^	L	0.27
m,p-Xylene	8260B	HW,SED,S	20	L	75 - 120^^	L	0.45
o-Xylene	8260B	HW,SED,S	20	L	75 - 120^^	L	0.13

- (1) MDL's have been based on the EPA method of determining method detection limits.  
 ^^ QA targets derived from internal goals.  
 v A method validation study is needed for these compounds.

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## QUALITY ASSURANCE OBJECTIVES (Cont'd)

PARAMETER	Method Reference	Matrix	Precision % RPD	Conc. Range	Accuracy % Recovery	Conc. Range	Method (1) Detection Limit
<b>Volatiles (GC/PID)</b>							(ug/L)
Benzene	602 / 8021	SW,GW,Eff	20	L	80-120^^	L	0.10
Toluene	602 / 8021	SW,GW,Eff	20	L	80-120^^	L	0.13
Chlorobenzene	602 / 8021	SW,GW,Eff	20	L	80-120^^	L	0.24
Ethyl Benzene	602 / 8021	SW,GW,Eff	20	L	80-120^^	L	0.52
Xylenes	602 / 8021	SW,GW,Eff	20	L	80-120^^	L	0.31
1,2-Dichlorobenzene	602 / 8021	SW,GW,Eff	20	L	80-120^^	L	0.15
1,3-Dichlorobenzene	602 / 8021	SW,GW,Eff	20	L	80-120^^	L	0.18
1,4-Dichlorobenzene	602 / 8021	SW,GW,Eff	20	L	80-120^^	L	0.15
<b>Volatiles (GC/PID)</b>							(ug/Kg)
Benzene	8021	IHW,SED,S	20	L	80-120^^	L	0.13
Toluene	8021	IHW,SED,S	20	L	80-120^^	L	0.14
Chlorobenzene	8021	IHW,SED,S	20	L	80-120^^	L	
Ethyl Benzene	8021	IHW,SED,S	20	L	80-120^^	L	0.079
Xylenes	8021	IHW,SED,S	20	L	80-120^^	L	0.18
1,2-Dichlorobenzene	8021	IHW,SED,S	20	L	80-120^^	L	
1,3-Dichlorobenzene	8021	IHW,SED,S	20	L	80-120^^	L	
1,4-Dichlorobenzene	8021	IHW,SED,S	20	L	80-120^^	L	
<b>Gasoline Range Organics</b>							(ug/L)
GRO	8015M	SW,GW,Eff	20	L	80-120^^	L	0.052
<b>Gasoline Range Organics</b>							(ug/Kg)
GRO	8015M	IHW,SED,S	20	L	80-120^^	L	0.012
<b>Micro Extraction (GC/ECD)</b>							(ug/L)
1,2-Dibromo-3-chloropropane (DBCP)	8011	DW,SW,GW,Eff	20	L	80-120^^	L	0.010^^
1,2-Dibromoethane (EDB)	8011	DW,SW,GW,Eff	20	L	80-120^^	L	0.010^^

(1) MDL's have been based on the EPA method of determining method detection limits.  
 ^^ QA targets derived from internal goals.

Table 5.2

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

<i>PARAMETER</i>	<i>Method Reference</i>	<i>Matrix</i>	<i>Precision % RPD</i>	<i>Conc. Range</i>	<i>Accuracy % Recovery</i>	<i>Conc. Range</i>	<i>Method (1) Detection Limit</i>
<b>Semivolatiles</b>							(ug/L)
Accenaphthene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	1.7
Accenaphthylene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	1.5
Anthracene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	1.2
Benidine	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	5.0^
Benzoic acid	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	3.8
Benzo(a)anthracene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	1.2
Benzo(b)fluoranthene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	1.5
Benzo(k)fluoranthene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	2.4
Benzo(g,h,i)perylene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	1.5
Benzo(a)pyrene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	1.0
Benzyl alcohol	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	2.5
bis(2-Chloroethoxy)methane	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	1.7
bis(2-Chloroethyl)ether	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	2.1
bis(2-Chloroisopropyl)ether	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	1.8
bis(2-Ethylhexyl)phthalate	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	7.2
4-Bromophenyl phenyl ether	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	1.4
Butyl benzyl phthalate	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	1.0
4-Chloroaniline	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	2.6
2-Chloronaphthalene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	1.5
4-Chloro-3-methylphenol	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	2.3
2-Chlorophenol	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	2.0
4-Chlorophenyl phenyl ether	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^	L	1.8

(1) MDL's have been based on the EPA method of determining method detection limits.  
 ^ QA targets derived from internal goals.

Table 5.2

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

<i>PARAMETER</i>	<i>Method Reference</i>	<i>Matrix</i>	<i>Precision % RPD</i>	<i>Conc. Range</i>	<i>Accuracy % Recovery</i>	<i>Conc. Range</i>	<i>Method (1) Detection Limit</i>
<b>Semivolatiles</b>							(ug/L)
Chrysene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.1
Dibenzo(a,h)anthracene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.8
Dibenzofuran	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.6
Di-n-butylphthalate	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.0
1,2-Dichlorobenzene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.8
1,3-Dichlorobenzene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.6
1,4-Dichlorobenzene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.6
3,3'-Dichlorobenzidine	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.6
2,4-Dichlorophenol	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	2.1
Diethylphthalate	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.8
2,4-Dimethylphenol	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	2.1
Dimethylphthalate	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.6
4,6-Dinitro-2-methylphenol	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	2.9
2,4-Dinitrophenol	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	2.8
2,4-Dinitrotoluene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	2.3
2,6-Dinitrotoluene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	2.6
Di-n-octyl phthalate	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.0
Fluoranthene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.4
Fluorene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.8
Hexachlorobenzene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.2
Hexachlorobutadiene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.9
Hexachlorocyclopentadiene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.3

(1) MDL's have been based on the EPA method of determining method detection limits.  
 ^^ QA targets derived from internal goals.

Table 5.2

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

<i>PARAMETER</i>	<i>Method Reference</i>	<i>Matrix</i>	<i>Precision % RPD</i>	<i>Conc. Range</i>	<i>Accuracy % Recovery</i>	<i>Conc. Range</i>	<i>Method (1) Detection Limit</i>
<b>Semivolatiles</b>							<b>(ug/L)</b>
Hexachloroethane	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	2.3
Indeno(1,2,3-cd)pyrene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.7
Isophorone	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.4
1-Methylnaphthalene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	2.0
2-Methylnaphthalene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.8
2-Methylphenol	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	2.4
4-Methylphenol	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	2.4
Naphthalene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.1
2-Nitroaniline	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	2.3
3-Nitroaniline	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.6
4-Nitroaniline	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	3.6
Nitrobenzene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.4
2-Nitrophenol	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.5
4-Nitrophenol	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	3.5
n-Nitrosodimethylamine	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	2.2
n-Nitrosodiphenylamine	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.9
n-Nitroso-di-n-propylamine	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	2.4
Pentachlorophenol	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	2.3
Phenanthrene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.1
Phenol	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.6
Pyrene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.0
1,2,4-Trichlorobenzene	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	1.7
2,4,5-Trichlorophenol	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	2.0
2,4,6-Trichlorophenol	625 / 8270C	SW,GW,Eff	20	L	70 -130 ^^	L	2.2

(1) MDL's have been based on the EPA method of determining method detection limits.  
 ^^ QA targets derived from internal goals.

Table 5.2

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

<i>PARAMETER</i>	<i>Method Reference</i>	<i>Matrix</i>	<i>Precision % RPD</i>	<i>Conc. Range</i>	<i>Accuracy % Recovery</i>	<i>Conc. Range</i>	<i>Method (1) Detection Limit</i>
<b>Semivolatiles</b>							(ug/Kg)
Accenaphthene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.2
Accenaphthylene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.6
Anthracene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.2
Benzidine	8270C	HW,SED,S	20	L	70 -130 ^^	L	5.0^^
Benzoic acid	8270C	HW,SED,S	20	L	70 -130 ^^	L	5.0^^
Benzo(a)anthracene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.4
Benzo(b)fluoranthene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.5
Benzo(k)fluoranthene	8270C	HW,SED,S	20	L	70 -130 ^^	L	2.1
Benzo(g,h,i)perylene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.8
Benzo(a)pyrene	8270C	HW,SED,S	20	L	70 -130 ^^	L	0.88
Benzyl alcohol	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.2
bis(2-Chloroethoxy)methane	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.1
bis(2-Chloroethyl)ether	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.1
bis(2-Chloroisopropyl)ether	8270C	HW,SED,S	20	L	70 -130 ^^	L	0.83
bis(2-Ethylhexyl)phthalate	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.9
4-Bromophenyl phenyl ether	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.6
Butyl benzyl phthalate	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.5
4-Chloroaniline	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.5
2-Chloronaphthalene	8270C	HW,SED,S	20	L	70 -130 ^^	L	2.1
4-Chloro-3-methylphenol	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.2
2-Chlorophenol	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.3
4-Chlorophenyl phenyl ether	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.2

(1) MDL's have been based on the EPA method of determining method detection limits.  
 ^^ QA targets derived from internal goals.

Table 5.2

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

<i>PARAMETER</i>	<i>Method Reference</i>	<i>Matrix</i>	<i>Precision % RPD</i>	<i>Conc. Range</i>	<i>Accuracy % Recovery</i>	<i>Conc. Range</i>	<i>Method (1) Detection Limit</i>
<b>Semivolatiles</b>							(ug/Kg)
Chrysene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.4
Dibenzo(a,h)anthracene	8270C	HW,SED,S	20	L	70 -130 ^^	L	2.3
Dibenzofuran	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.0
Di-n-butylphthalate	8270C	HW,SED,S	20	L	70 -130 ^^	L	2.0
1,2-Dichlorobenzene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.7
1,3-Dichlorobenzene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.1
1,4-Dichlorobenzene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.3
3,3'-Dichlorobenzidine	8270C	HW,SED,S	20	L	70 -130 ^^	L	2.3
2,4-Dichlorophenol	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.8
Diethylphthalate	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.1
2,4-Dimethylphenol	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.0
Dimethylphthalate	8270C	HW,SED,S	20	L	70 -130 ^^	L	0.90
4,6-Dinitro-2-methylphenol	8270C	HW,SED,S	20	L	70 -130 ^^	L	2.8
2,4-Dinitrophenol	8270C	HW,SED,S	20	L	70 -130 ^^	L	5.0^^
2,4-Dinitrotoluene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.4
2,6-Dinitrotoluene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.0
Di-n-octyl phthalate	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.7
Fluoranthene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.1
Fluorene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.1
Hexachlorobenzene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.1
Hexachlorobutadiene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.4
Hexachlorocyclopentadiene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.9

(1) MDL's have been based on the EPA method of determining method detection limits.  
 ^^ QA targets derived from internal goals.

Table 5.2

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

<i>PARAMETER</i>	<i>Method Reference</i>	<i>Matrix</i>	<i>Precision % RPD</i>	<i>Conc. Range</i>	<i>Accuracy % Recovery</i>	<i>Conc. Range</i>	<i>Method (1) Detection Limit</i>
<b>Semivolatiles</b>							(ug/Kg)
Hexachloroethane	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.4
Indeno(1,2,3-cd)pyrene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.8
Isophorone	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.0
1-Methylnaphthalene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.5
2-Methylnaphthalene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.2
2-Methylphenol	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.1
4-Methylphenol	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.4
Naphthalene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.4
2-Nitroaniline	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.0
3-Nitroaniline	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.4
4-Nitroaniline	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.9
Nitrobenzene	8270C	HW,SED,S	20	L	70 -130 ^^	L	0.86
2-Nitrophenol	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.0
4-Nitrophenol	8270C	HW,SED,S	20	L	70 -130 ^^	L	2.2
n-Nitrosodimethylamine	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.5
n-Nitrosodiphenylamine	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.3
n-Nitroso-di-n-propylamine	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.1
Pentachlorophenol	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.6
Phenanthrene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.0
Phenol	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.1
Pyrene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.3
1,2,4-Trichlorobenzene	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.5
2,4,5-Trichlorophenol	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.2
2,4,6-Trichlorophenol	8270C	HW,SED,S	20	L	70 -130 ^^	L	1.3

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(1) MRLs have been based on the EPA method of determining method detection limits.  
MRLs derived from internal goals.



Table 5.2

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

<i>PARAMETER</i>	<i>Method Reference</i>	<i>Matrix</i>	<i>Precision % RPD</i>	<i>Conc. Range</i>	<i>Accuracy % Recovery</i>	<i>Conc. Range</i>	<i>Method (1) Detection Limit</i>
<b>Wet Chemistry</b>							<b>(mg/L)(mg/Kg)</b>
Total Cyanides	EPA 335.2	SW,GW,ET	25	L	80 - 120^^	L	0.0049
Total Cyanides	SW 9010B	HW,SED,S	25	L	75 - 125^^	L	0.0062
Amenable Cyanides	EPA 335.1	SW,GW,ET	25	L	70-130^^	L	0.0010^^
Amenable Cyanides	SW 9010B	HW,SED,S	25	L	70-130^^	L	0.010^^
Total Phenolics	EPA 420.1	SW,GW,ET	25	L	80 - 120^^	L	0.0083
Total Sulfide	EPA 376.2	SW,GW,ET	25	L	80 - 120^^	L	0.10^^
Total Sulfide	SW 9030B	HW,SED,S	25	L	70 - 130 ^^	L	0.50^^
Oil & Grease (Grav)	EPA 413.1	SW,GW,ET	25	L	75 - 125 ^^	L	1.5^^
Oil & Grease (IR)	EPA 413.2	SW,GW,ET	25	L	75 - 125 ^^	L	0.087
Oil & Grease (IR)	EPA 413.2	HW,SED,S	25	L	75 - 125 ^^	L	1.1
Oil & Grease (Grav)	SW 9070	SW,GW,ET	25	L	75 - 125 ^^	L	1.5^^
Oil & Grease (Grav)	SW 9071A	HW,SED,S	25	L	75 - 125 ^^	L	10^^
Total Petroleum Hydrocarbons	EPA 418.1	SW,GW,ET	25	L	80 - 120 ^^	L	0.50^^
Total Petroleum Hydrocarbons	SW 8440	HW,SED,S	25	L	80 - 120 ^^	L	1.0^^
Total Petroleum Hydrocarbons	FL-PRO	SW,GW,ET	25	L	80 - 120 ^^	L	0.10^^
Total Petroleum Hydrocarbons	FL-PRO	HW,SED,S	25	L	80 - 120 ^^	L	4.0^^
EP Toxicity Test Methods	SW 1310A	HW,SED,S	25	vv	vv	vv	vv
Toxicity Characteristics Leaching Procedure	SW 1311	HW,SED,S	25	vv	vv	vv	vv
Multiple Extraction Procedure	SW 1320	HW,SED,S	25	vv	vv	vv	vv
Ignitability	SW 1010	SW,GW,ET(2)	25	----	----	----	1 degree C
Reactive Cyanide Released from Waste	**	HW,SED,S	25	L	75 - 125 ^^	L	1.0^^
Reactive Sulfide Released from Waste	**	HW,SED,S	25	L	75 - 125 ^^	L	1.0^^
(pH)	EPA 150.1	SW,GW,ET	25	----	----	----	0.1 pH unit
(pH)	SW 9045C	HW,SED,S	25	----	----	----	0.1 pH unit

(1) MDL's have been based on the EPA method of determining method detection limits

^^ QA targets derived from internal goals.

\*\* EPA Methods from SW846 Volume III Chapter Seven.

(2) Ignitability tests are for Liquid samples only and are not approved for Solid Waste and Sludges.

vv Data for these parameters should obtained from each individual method for which the TCLP or EP Toxicity extract is to be analyzed.

## QUALITY ASSURANCE OBJECTIVES (Cont'd)

- (1) MDL's have been based on the EPA method of determining method detection limits.
- ^^ QA targets derived from internal goals.
- \*\* EPA Methods from SW846 Volume III Chapter Seven.
- (2) Ignitibility tests are for Liquid samples only and are not approved for Solid Waste and Sludges.
- vv Data for these parameters should be obtained from each individual method for which the TCLP or EP Toxicity extract is to be analyzed.

### ACRONYMS

EPA	-Refers to methods found in any EPA approved source
MDL	-Method Detection Limit
SW	-Surface Water
GW	-Ground Water
Eff	-Effluent water source
HW	-Hazardous Waste
SED	-Sediments (includes domestic sludges)
S	-Soils

## REFERENCES

"Definition and Procedure for the Determination of the Method Detection Limit - Revision 1.11", 40 CFR Part 136, Appendix B.

Methods for Chemical Analysis of Water and Waste, EPA 600 / 4-79 / 020, revised March, 1983.

Methods for the Determination of Metals in Environmental Samples, US. EPA 600 / 4-91 / 010, June 1991.

Test Methods for Evaluating Solid Waste. Physical / Chemical Methods, Third Edition (EPA SW-846), 1986 as amended by Final Update III, December 1996.

Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, US EPA 600/4-82-057, July, 1982.

Manual of Analytical Quality Control for Pesticides and Related Compounds in Human and Environmental Samples, US EPA 600/1-79-008, January, 1979.

Method For Determination of Gasoline Range Organics, State of Tennessee, Department of Environment and Conservation, Division of Underground Storage Tanks, 1993.

Method For Determination of Diesel Range Organics, State of Tennessee, Department of Environment and Conservation, Division of Underground Storage Tanks, 1993.

Leaking Underground Storage Tanks (LUST) and Petroleum - Analytical and Quality Assurance Guidance, Wisconsin Department of Natural Resources, July 1993, PUBL-SW-130 93.

**SECTION 6.0**

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**SAMPLING PROCEDURES**

## SAMPLING PROCEDURES

### Guidelines for Sampling Preparation:

On the basis of the chemical parameters to be analyzed, the lab manager will supply a sample container list (Analytical Request Form) to be prepared by the shipping department, along with the appropriate instructions for the preservatives needed for each container. Accura Analytical Laboratory, Inc. does not provide sampling services.

### Description of Containers:

Considerations for selecting a particular material for a sample container include:

1. Nature of the sample: Organic compounds, such as plasticizers, may be leached from polyethylene containers and interfere with the analysis of organic compounds. Therefore, glass containers with teflon lined caps are used for organic samples. Linear polyethylene or glass bottles are suitable for inorganic parameters. For similar reasons, foil lined containers will not be used for samples needing metal analyses.
2. Preservatives to be used: Mineral acids are used for the preservation of metals as some inorganic anions attach to plastics, therefore, polyethylene or glass containers will be used.
3. Checking Sample Bottles for Cleanliness: Proper cleaning of sample containers is necessary to minimize contamination of the sample. When a lot of sample containers is delivered, it is segregated from the approved sample containers, a representative sample or the containers is pulled and is filled with Deionized Water. The water is then checked for all analytes of interest to ensure there is no contamination. If a lot has no analytes with concentrations above the Quantitation Limits, the lot is "approved" and is given a number that will also be issued with all sample orders that receive these bottles. If the lot of sample containers fails, the following procedures are used to ensure all contamination is removed. Another sample of the containers is pulled when they cleaning is finished and all analyses of interest are checked for again. If the samples pass, the lot number is issued.

Procedures in cleaning the glass and polyethylene containers and their caps are as follows:

- a. Amber bottles. (For samples to be used for organic analyses)
  1. The bottles are soaked in Alconox detergent for one day.
  2. The bottles are rinsed with copious amounts of distilled water.
  3. The bottles are rinsed with a series of organic solvents to eliminate any organic contaminants. These solvents are:
    - (a.) acetone
    - (b.) methyl alcohol
  4. The bottles are air dried, heated to 200°F, cooled and capped with clean teflon lined caps.
- b. Plastic and Polyethylene bottles
  1. Bottles and lids are rinsed with 5% sodium hydroxide to remove all the acidic ions.
  2. The bottles are rinsed with distilled water.
  3. The bottles are rinsed with 5% ultrex nitric acid to remove the basic ions.
  4. The bottles are rinsed several times with deionized water, drained and air dried.
- c. Bottle caps
  1. Paper and polyethylene liners will be removed.
  2. The bottle caps are washed with 2% Alconox detergent, rinsed with distilled water and dried at 40°C.
- d. Teflon liners
  1. Teflon liners are washed with 2% Alconox detergent and rinsed with distilled water.
  2. The liners are rinsed with acetone, and methyl alcohol to remove any organic residue, and allowed to air dry.

### Shipping and Packing Procedures

The laboratory manager will plan and prepare a list of sample containers with pertinent directions for sample preservatives to be used for all the required parameters to be analyzed. He will direct the shipping and receiving personnel to clean and prepare sample containers for sampling and shipping.

The laboratory manager will resolve any questions regarding the possible interferences related to the sample container before the field sampling program begins. In order to protect the glass containers from breakage, styrofoam linings will be used during shipping.

### Sample Preservation

Every effort will be made to achieve the shortest possible interval between sample collection and analysis to protect samples from changes that affect the sample composition.

### Sample Preservation Procedures

The primary functions of sample preservation are:

- 1) to retard biological action,
- 2) to retard precipitation or hydrolysis of chemical compounds and their complexes, and
- 3) to reduce volatility of constituents.

### Methods of Sample Preservation

1. pH control: This prevents precipitation of metals, salt formation, and inhibit bacterial action.
2. Chemical addition: The choice of chemical depends on the change to be controlled. Mercuric chloride is commonly used as a bacterial inhibitor.
3. Refrigeration and Freezing: This is the best preservative technique available.

Methods of sample preservation and Holding Times are summarized in Table 6.1



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Preservatives, Holding Times and Sample Containers

Parameters	Preservatives <sup>7</sup>		Holding Times		Containers <sup>5</sup>	
	Liquid	Solid	Liquid	Solid	Liquid	Solid
VOLATILE ORGANICS	Cool 4°C, (.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual Cl present) No headspace, HCl to pH < 2	Cool 4°C No headspace	14 days	14 days	2-40 mL glass vial, PTFE septa cap	2-40 mL glass vial or 2-4 oz glass PTFE septa cap
Acrolein & Acrylonitrile	Cool 4°C, (.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual Cl present) No headspace, HCl to 4 < pH < 5	Cool 4°C No headspace	14 days	14 days	2-40 mL glass vial	4 oz cwm <sup>4</sup> PTFE septa cap
Purgeable Aromatic Hydrocarbons	Cool 4°C, (.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual Cl present) HCl to pH < 2	Cool 4°C No headspace	14 days	14 days	2-40 mL glass vial, PTFE septa cap	4 oz cwm <sup>4</sup> PTFE septa cap
Purgeable Halocarbons	Cool 4°C, (.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual Cl present) No headspace	Cool 4°C No headspace	14 days	14 days	2-40 mL glass vial, PTFE septa cap	4 oz cwm <sup>4</sup> PTFE septa cap
SEMIVOLATILE ORGANICS	Cool 4°C, (.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual Cl present)	Cool 4°C	7d/40d <sup>2</sup>	14d/40d <sup>9</sup>	2 - 1 L.A.G. <sup>6</sup>	8 oz cwm <sup>10</sup>
Benzidines	Cool 4°C, (.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual Cl present)	Cool 4°C	7d/40d <sup>2</sup>	14d/40d <sup>9</sup>	1 L.A.G. <sup>6</sup>	8 oz cwm <sup>4</sup>
Chlorinated Herbicides	Cool 4°C	Cool 4°C	7d/40d <sup>2</sup>	14d/40d <sup>9</sup>	2 - 1 L.A.G. <sup>6</sup>	8 oz cwm <sup>4</sup>
Chlorinated Hydrocarbons	Cool 4°C	Cool 4°C	7d/40d <sup>2</sup>	14d/40d <sup>9</sup>	2 - 1 L.A.G. <sup>6</sup>	8 oz cwm <sup>4</sup>
Chlorinated Pesticides	Cool 4°C, H <sub>2</sub> SO <sub>4</sub> or NaOH to 5 < pH < 9	Cool 4°C	7d/40d <sup>2</sup>	14d/40d <sup>9</sup>	2 - 1 L.A.G. <sup>6</sup>	8 oz cwm <sup>10</sup>
Dioxins & Furans	Cool 4°C, (.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual Cl present)	Cool 4°C	30d/45d <sup>12</sup>	30d/45d <sup>12</sup>	2 - 1 L.A.G. <sup>6</sup>	8 oz cwm <sup>4</sup>
Haloethers	Cool 4°C, (.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual Cl present)	Cool 4°C	7d/40d <sup>2</sup>	14d/40d <sup>9</sup>	2 - 1 L.A.G. <sup>6</sup>	8 oz cwm <sup>4</sup>

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## Preservatives, Holding Times and Sample Containers

Parameters	Preservatives <sup>7</sup>		Holding Times		Containers <sup>5</sup>	
	Liquid	Solid	Liquid	Solid	Liquid	Solid
Nitroaromatics & Isophorone	Cool 4°C, (.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual Cl present)	Cool 4°C	7d/40d <sup>2</sup>	14d/40d <sup>9</sup>	2 - 1 L.A.G. <sup>6</sup>	8 oz cwm <sup>4</sup>
Nitrosamines	Cool 4°C, (.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual Cl present)	Cool 4°C	7d/40d <sup>2</sup>	14d/40d <sup>9</sup>	1 L.A.G. <sup>6</sup>	8 oz cwm <sup>4</sup>
PCBs/Pesticides	Cool 4°C	Cool 4°C	7d/40d <sup>2</sup>	14d/40d <sup>9</sup>	2 - 1 L.A.G. <sup>6</sup>	8 oz cwm <sup>10</sup>
Phenolics	Cool 4°C, H <sub>2</sub> SO <sub>4</sub> to pH < 2	Cool 4°C	28 days	28 days	1 L.B.R. <sup>8</sup>	8 oz cwm <sup>4</sup>
Phenols	Cool 4°C, (.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual Cl present)	Cool 4°C	7d/40d <sup>2</sup>	14d/40d <sup>9</sup>	2 - 1 L.A.G. <sup>6</sup>	8 oz cwm <sup>4</sup>
Phthalate Esters	Cool 4°C	Cool 4°C	7d/40d <sup>2</sup>	14d/40d <sup>9</sup>	2 - 1 L.A.G. <sup>6</sup>	8 oz cwm <sup>4</sup>
Polynuclear Aromatic Hydrocarbons	Cool 4°C, (.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual Cl present)	Cool 4°C	7d/40d <sup>2</sup>	14d/40d <sup>9</sup>	2 - 1 L.A.G. <sup>6</sup>	8 oz cwm <sup>4</sup>
METALS (Except Chromium(VI) & Hg)	Cool 4°C, HNO <sub>3</sub> to pH < 2	Cool 4°C	6 months	6 months	1 L HDPE <sup>3</sup>	8 oz cwm <sup>11</sup>
TRPH	Cool 4°C, H <sub>2</sub> SO <sub>4</sub> to pH < 2	Cool 4°C	28 days	28 days	2 - 1 L glass	8 oz cwm <sup>11</sup>
Chromium (VI)	Cool 4°C	Cool 4°C	24 hours	24 hours	250 mL HDPE <sup>3</sup>	8 oz cwm <sup>4</sup>
Cyanide (Total & Amenable)	Cool 4°C, NaOH to pH > 12, (0.6 Asbc Acid if residual Cl is present)	Cool 4°C	14 days	14 days	1 L HDPE <sup>3</sup>	8 oz cwm <sup>11</sup>
Mercury	Cool 4°C, HNO <sub>3</sub> to pH < 2	Cool 4°C	28 days	28 days	250 mL HDPE <sup>3</sup> or glass	8 oz cwm <sup>4</sup>
MISCELLANEOUS						
Acidity	Cool 4°C	N/A	48 hours	N/A	250 mL HDPE <sup>3</sup>	N/A
Alkalinity	Cool 4°C	N/A	48 hours	N/A	250 mL HDPE <sup>3</sup>	N/A

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Preservatives, Holding Times and Sample Containers

Parameters	<u>Preservatives<sup>7</sup></u>		<u>Holding Times</u>		<u>Containers<sup>5</sup></u>	
	Liquid	Solid	Liquid	Solid	Liquid	Solid
Ammonia	Cool 4°C, H <sub>2</sub> SO <sub>4</sub> to pH < 2	N/A	14 days	N/A	1 L HDPE <sup>3</sup>	N/A
Biochemical Oxygen Demand	Cool 4°C	N/A	48 hours	N/A	2 L HDPE <sup>3</sup>	N/A
Bromide	None required	N/A	28 days	N/A	250 mL HDPE <sup>3</sup>	N/A
Chemical Oxygen Demand <sup>1</sup>	Cool 4°C, H <sub>2</sub> SO <sub>4</sub> to pH < 2	N/A	28 days	N/A	125 mL HDPE <sup>3</sup>	N/A
Chloride	None required	None required	28 days	28 days	125 mL HDPE <sup>3</sup>	4 oz cwm <sup>4</sup>
Chlorine (Total & Residual)	None required	N/A	A.S.A.P.	N/A	500 mL HDPE <sup>3</sup>	N/A
Coliform, Fecal and Total	Cool 4°C, (.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual Cl present)	Cool 4°C	6 hours	8 hours	120 mL HDPE <sup>3</sup>	4 oz cwm <sup>4</sup>
Color	Cool 4°C	N/A	48 hours	N/A	125 mL HDPE <sup>3</sup>	N/A
Dissolved Oxygen, Probe	None required	N/A	0.5 hour	N/A	300 mL BOD btl.	N/A
Dissolved Oxygen, Winkler Method	Fix on site/store dark	N/A	8 hours	N/A	300 mL BOD btl.	N/A
Explosives	Cool 4°C	Cool 4°C	7d/40d	14d/40d <sup>2</sup>	2 - 1 L.A.G. <sup>6</sup>	8 oz cwm <sup>4</sup>
Fecal Streptococci	Cool 4°C, (.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual Cl present)	N/A	6 hours	N/A	250 mL HDPE <sup>3</sup>	N/A
Fluoride	None required	N/A	28 days	N/A	500 mL HDPE <sup>3</sup>	N/A
Hardness	HNO <sub>3</sub> or H <sub>2</sub> SO <sub>4</sub> to pH < 2	N/A	6 months	N/A	250 mL HDPE <sup>3</sup>	N/A
Hydrogen Ion (pH)	None required	Cool 4°C	A.S.A.P.	A.S.A.P.	60 mL HDPE <sup>3</sup>	4 oz cwm
Kjeldahl & Organic Nitrogen	Cool 4°C, H <sub>2</sub> SO <sub>4</sub> to pH < 2	N/A	28 days	N/A	1 mL HDPE <sup>3</sup>	N/A
Nitrate	Cool 4°C	Cool 4°C	48 hours	48 hours	250 mL HDPE <sup>3</sup>	8 oz cwm <sup>4</sup>
Nitrate-Nitrite	Cool 4°C, H <sub>2</sub> SO <sub>4</sub> to pH < 2	Cool 4°C	28 days	28 days	250 mL HDPE <sup>3</sup>	8 oz cwm <sup>4</sup>

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## Preservatives, Holding Times and Sample Containers

Parameters	<u>Preservatives</u> <sup>7</sup>		<u>Holding Times</u>		<u>Containers</u> <sup>5</sup>	
	Liquid	Solid	Liquid	Solid	Liquid	Solid
Nitrite	Cool 4°C	N/A	48 hours	N/A	125 mL HDPE <sup>3</sup>	N/A
Oil & Grease	Cool 4°C, H <sub>2</sub> SO <sub>4</sub> to pH < 2	Cool 4°C	28 days	28 days	2 - 1 L glass	8 oz cwm <sup>4</sup>
Organic Carbon	Cool 4°C, HCl H <sub>2</sub> SO <sub>4</sub> to pH < 2	Cool 4°C	28 days	28 days	125 mL HDPE <sup>3</sup>	4 oz cwm <sup>4</sup>
Orthophosphate	Filter immediately Cool 4°C	N/A	48 hours	N/A	125 mL HDPE <sup>3</sup>	N/A
Phosphorus (Elemental)	Cool 4°C	N/A	48 hours	N/A	1 L.B.R.	N/A
Phosphorus (Total)	Cool 4°C, H <sub>2</sub> SO <sub>4</sub> to pH < 2	N/A	28 days	N/A	125 mL HDPE <sup>3</sup>	N/A
Radiological Test, Gross Alpha	HNO <sub>3</sub> to pH < 2	Cool 4°C	6 months	6 months	2 L HDPE <sup>3</sup>	8 oz HDPE <sup>3</sup>
Radiological Test, Gross Beta	HNO <sub>3</sub> to pH < 2	Cool 4°C	6 months	6 months	2 L HDPE <sup>3</sup>	8 oz HDPE <sup>3</sup>
Radiological Radium (Total)	HNO <sub>3</sub> to pH < 2	Cool 4°C	6 months	6 months	2 L HDPE <sup>3</sup>	8 oz HDPE <sup>3</sup>
Residue (Filterable)	Cool 4°C	N/A	7 days	N/A	250 mL HDPE <sup>3</sup>	N/A
Residue (Non-Filterable)	Cool 4°C	N/A	7 days	N/A	250 mL HDPE <sup>3</sup>	N/A
Residue (Settleable)	Cool 4°C	N/A	48 hours	N/A	1mhalf cone	N/A
Residue (Total)	Cool 4°C	N/A	7 days	N/A	250 mL HDPE <sup>3</sup>	N/A
Residue (Volatile)	Cool 4°C	N/A	7 days	N/A	250 mL HDPE <sup>3</sup>	N/A
Silica	Cool 4°C	N/A	28 days	N/A	125 mL HDPE <sup>3</sup>	N/A
Specific Conductance	Cool 4°C	N/A	28 days	N/A	250 mL HDPE <sup>3</sup>	N/A
Sulfate	Cool 4°C	Cool 4°C	28 days	28 days	125 mL HDPE <sup>3</sup>	4 oz cwm <sup>4</sup>
Sulfide	Cool 4°C, 4 mL ZnAc plus NaOH to pH > 9	Cool 4°C	7 days	7 days	1 L HDPE <sup>3</sup>	8 oz cwm <sup>4</sup>
Sulfite	Cool 4°C	N/A	A.S.A.P.	N/A	125 mL HDPE <sup>3</sup>	N/A
Surfactant	Cool 4°C	N/A	48 hours	N/A	500 mL HDPE <sup>3</sup>	N/A

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Preservatives, Holding Times and Sample Containers

Parameters	<u>Preservatives</u> <sup>7</sup>		<u>Holding Times</u>		<u>Containers</u> <sup>5</sup>	
	Liquid	Solid	Liquid	Solid	Liquid	Solid
TCLP Extractable Fraction	Cool 4°C	Cool 4°C	14 days/ N/A/ 14 days <sup>13</sup>	14 days/ N/A/ 14 days <sup>13</sup>	3 -1 L.A.G. <sup>6</sup>	16 oz cwm <sup>4</sup>
TCLP Volatile Fraction	Cool 4°C, No headspace	Cool 4°C, No headspace	14 days/ 7 days/ 40 days <sup>13</sup>	14 days/ 7 days/ 40 days <sup>13</sup>	500 mL glass PTFE lined septa	4 oz glass with PTFE-lined septum
TCLP Inorganic Fraction (Hg)	Cool 4°C	Cool 4°C	28 days/ N/A/ 28 days <sup>13</sup>	28 days/ N/A/ 28 days <sup>13</sup>	1 L HDPE <sup>3</sup>	16 oz cwm <sup>4</sup>
TCLP Inorganic Fraction (all other metals)	Cool 4°C	Cool 4°C	180 days/ N/A/ 180 days <sup>13</sup>	180 days/ N/A/ 180 days <sup>13</sup>		
Temperature	None required	N/A	A.S.A.P.	N/A	2 L HDPE <sup>3</sup>	N/A
Total Organic Halogens (TOX)	Cool 4°C, H <sub>2</sub> SO <sub>4</sub> to pH < 2	28 days	28 days	28 days	16 oz B.R. <sup>8</sup>	4 oz cwm <sup>4</sup>
Turbidity	Cool 4°C	N/A	48 hours	N/A	250 mL HDPE <sup>3</sup>	N/A

Notes:

1. Organic carbon content must be greater than 50 mg/L for valid results.
2. 7 days until extraction/analyzed within 40 days of extraction.
3. HDPE (high density polyethylene bottles).
4. CWM (clear wide mouth) glass jars.
5. All containers must have Teflon-lined seals. (Teflon-lined septa for VOA vials).
6. Amber glass jug.
7. High concentration samples require cooling to only 4°C.

8. B.R. (Boston round).
  9. 14 days until extraction/analyzed with 40 days of extraction.
  10. Semivolatiles, PCBs/pesticides may be collected in the same container.
  11. Metals, TRPH, & cyanide may be collected in the same container.
  12. Holding time for TPH is 28 days.
  13. Sample containers for TPRH are 2 x 1 L glass bottles.
- N/A - Not available.

**SECTION 7.0**

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**SAMPLE CUSTODY**

### SAMPLE CUSTODY PROCEDURES:

The shipping and receiving personnel at AAL are solely responsible for the receipt of all samples and their shipping documents. The samples received will be checked thoroughly for any leakage and compared with the chain of custody document. Then the chain-of-custody document is signed and the field sheet is placed with the samples. Each sample is then logged in a bound log book, assigning each project a laboratory ID number in ascending order, and each station its individual AAL code number with label. This AAL number remains with the sample from its reception, and will not be duplicated.

The following information about each group of samples is recorded in the sample log book:

- Client or Contract
- Location of Sampling
- Type of Sample or Waste
- Number and designation of Samples taken
- Date and time of collection for each sample
- Any field measurement taken (i.e., pH, temp. etc.)
- Sample preservation
- Analysis to be performed

After samples have been logged in and given AAL numbers, they are immediately stored in a refrigerator at 4.0 °C. The lab tracking and custody sheets for each group of samples are forwarded to the lab manager who schedules the analysis of samples with the analysts. If improper sample preservation was noted during log-in, a Variance report is filled out and placed in the project folder.

Any problems encountered or unusual sample conditions noted by the analyst during sample analysis are recorded on the data sheets. If a required sample is collected but cannot be analyzed, it is indicated with an explanation. The laboratory manager is responsible for verification of data transcription.

## CHAIN OF CUSTODY

6017 Financial Drive, Norcross, GA 30071  
Phone # (770) 449-8800 Fax # (770) 449-5477

<b>Company Name:</b>	<b>Billing address:</b>
<b>Address:</b>	<b>Client P.O. #</b>
<b>Report Sent to: (Client Contact):</b>	<b>For Laboratory Use Only</b>
<b>Contact Phone #</b> <b>Fax #</b>	<b>Custody Seal:</b> Y   N   Page   of OP
<b>Project Name:</b>	<b>QC Level:</b> N   2   3   4 <b>Int Temp:</b>
<b>Project Number:</b>	<b>Sample Condition:</b> <b>AAL Lab Project #</b>

[illegible]

Matrix Guide: (S = Soil) (W = Water) (L = Liquid) (C = Cartridge) (SL = Sludge) (A = Air Sample) (F = Foods) (M = Miscellaneous)

COX07.2 X15

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**FORM 7.1**

102141



Figure 7.1 Sample Seal & Tag

ACCURA ANALYTICAL LAB, INC. 6017 FINANCIAL DR., NORCROSS, GA 30071 PHONE: (770) 449-8800	SITE NAME:	<input type="checkbox"/> GRAB <input type="checkbox"/> COMPOSITE
	SAMPLE #	DATE: TIME:
	LAB I.D. #	COLLECTED BY:
	ANALYSIS:	PRESERVATIVE: HCL

ACCURA ANALYTICAL LAB, INC. 6017 FINANCIAL DR., NORCROSS, GA 30071 PHONE: (770) 449-8800	SITE NAME:	<input type="checkbox"/> GRAB <input type="checkbox"/> COMPOSITE
	SAMPLE #	DATE: TIME:
	LAB I.D. #	COLLECTED BY:
	ANALYSIS:	PRESERVATIVE:



ACCURA ANALYTICAL LABORATORY, INC.  
Environmental Analytical Services

Page \_\_\_\_\_ of \_\_\_\_\_  
Hour/Temp \_\_\_\_\_  
1.144% Log-In \_\_\_\_\_

### Log-In Record

Client Name: \_\_\_\_\_ Client Contact: \_\_\_\_\_  
Project Name: \_\_\_\_\_ Client Code # / Client Project #: \_\_\_\_\_  
Accura Project #: \_\_\_\_\_ Chain of Custody #: \_\_\_\_\_  
Date Samples Submitted: \_\_\_\_\_ Request Reviewed By: \_\_\_\_\_  
Samples Due Date: \_\_\_\_\_ RUSH: \_\_\_\_\_

NUMBER OF SAMPLES: Soil _____ Water _____ Air _____ OTHER: _____ Proper Sample Preservation?: YES NO IF NO, explain: _____ Residual Chlorine in waters (CN, SVOC, Pest/PCB, Herb): YES NO If YES, name amount of Sodium Arsenite / Sodium Thiosulfate (circle one) added: _____	Containers Received: _____ 1-gal amber _____ 32 oz Jar _____ Tedlar Bags _____ 32 oz amber _____ 9 oz Jar _____ Air Cartridges _____ 32 oz HDPE _____ 8 oz tall Jar _____ Ziploc Bags _____ 16 oz HDPE _____ 4 oz Jar _____ Other _____ 8 oz HDPE _____ 2 oz Jar _____ VOC vials _____ Teflon Tubes _____
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### TESTS REQUIRED:

1. _____ ( )	6. _____ ( )	11. _____ ( )
2. _____ ( )	7. _____ ( )	12. _____ ( )
3. _____ ( )	8. _____ ( )	13. _____ ( )
4. _____ ( )	9. _____ ( )	14. _____ ( )
5. _____ ( )	10. _____ ( )	15. _____ ( )

LAB ID#	Client Sample #	Test(s) To Be Performed	Refrigerate #	Matrix Type	pH (Record for all waters not chem. Post / Marb)	Collection Date
AB					1 2 3 4 5 6 7 8 9 10 11 12 13 14	
AB					1 2 3 4 5 6 7 8 9 10 11 12 13 14	
AB					1 2 3 4 5 6 7 8 9 10 11 12 13 14	
AB					1 2 3 4 5 6 7 8 9 10 11 12 13 14	
AB					1 2 3 4 5 6 7 8 9 10 11 12 13 14	
AB					1 2 3 4 5 6 7 8 9 10 11 12 13 14	
AB					1 2 3 4 5 6 7 8 9 10 11 12 13 14	
AB					1 2 3 4 5 6 7 8 9 10 11 12 13 14	
AB					1 2 3 4 5 6 7 8 9 10 11 12 13 14	
AB					1 2 3 4 5 6 7 8 9 10 11 12 13 14	
AB					1 2 3 4 5 6 7 8 9 10 11 12 13 14	
AB					1 2 3 4 5 6 7 8 9 10 11 12 13 14	
AB					1 2 3 4 5 6 7 8 9 10 11 12 13 14	
AB					1 2 3 4 5 6 7 8 9 10 11 12 13 14	
AB					1 2 3 4 5 6 7 8 9 10 11 12 13 14	
AB					1 2 3 4 5 6 7 8 9 10 11 12 13 14	

Special Handling Instructions-QA/QC Report Requirements: \_\_\_\_\_

ICP GFAA Hg DIGSTN EXTRACT TPROAG W.CHEM/TCLP PST/PCB/BBB DRO STEU/GRO SVOC/MS VOC  
ASI Lab & Co Hygeia Siliker Hydrologic Other \_\_\_\_\_

FILE  
Revised 02/04/98

FORM 7.2

102143

**SECTION 8.0**

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**ANALYTICAL PROCEDURES**

## SAMPLE PREPARATION METHODS

The Following EPA procedures are used in the preparation of samples.

**TABLE 8.1**  
**SAMPLE EXTRACTION, PREPARATION AND CLEANUP METHODOLOGY**

SAMPLE PREP METHOD #	DESCRIPTION	MATRIX	SAMPLE PREP FOR THE FOLLOWING METHODS
200.7	Acid Digestion	All	200.7, 6010B
200.9	Acid Digestion	Water	200.9
3005A	Acid Digestion	Water	200, 6010B, 7000
3010A	Acid Digestion	Aqueous	200, 6010B, 7000
3015	Microwave Digestion	Aqueous	200, 6010B, 7000
3020A	Acid Digestion	Aqueous	200, 7000 (GFAA)
3050B	Acid Digestion	Solids, Soils & Sludges	200, 6010B, 7000
3051	Microwave Digestion	Solids, Soils & Sludges	200, 6010B, 7000
245.1, 7470A	Mercury Digestion	Water & Aqueous	245.1, 7470A
245.5, 7471A	Mercury Digestion	Solids, Soils & Sludges	245.5, 7471A
3510C	Separatory Funnel Liquid/Liquid Extraction	Water & Sludges	608, 615, 625, DRO/8015, 8081A, 8082, 8151A, 8270C
3520C	Continuous Liquid/Liquid Extraction	Water & Sludges	608, 615, 625, DRO/8015, 8081A, 8082, 8151A, 8270C
3540C	Soxhlet Extraction	Solids, Soils, Sludges	DRO/8015, 8081A, 8082, 8151A, 8270C
3550B	Ultrasonic Extraction	Solids & Soils	DRO/8015, 8081A, 8082, 8151A, 8270C
3580A	Waste Dilution	Oils & Neat Products	GRO/8015, 602, 608, 615, 624, 625 DRO/8015, 8021B, 8081A, 8082, 8151A, 8260B, 8270C
3620B	Florisil Cleanup	All	608, 8081A, 8082
3630C	Silica Gel Cleanup	All	PNAs/625, 8270C
3660B	Sulfur Cleanup	All	608, 8081A, 8082
3665A	Sulfuric Acid Cleanup	All	608, 8082
5030B	Purge & Trap	All	GRO/8015, 602, 8021A, 624, 8260B
8011	Microextraction	Water & Aqueous	8011
1310A	EP-TOX Extraction	Solids, Soils, Sludges	200.7, 6010B, 7470A, 8081A, 8082, 8151A, 8260B, 8270C
1311	TCLP Extraction	Solids, Soils, Sludges	200.7, 6010B, 7470A, 8081A, 8082, 8151A, 8260B, 8270C
1320	Multiple Extraction	Solids, Soils, Sludges	200.7, 6010B, 7470A, 8081A, 8082, 8151A, 8260B, 8270C

## ANALYTICAL PROCEDURES

The Following EPA procedures are used in the analysis of samples.

**TABLE 8.2**

### METHOD

WATER	SOIL	PARAMETERS
150.1 (a)	9045 (b)	pH
160.3 (a)	160.3 (a)	Total Solids
6010B (b)	6010B (b)	Aluminum
6010B,7040A,7041A (b)	6010B,7040A,7041A (b)	Antimony
6010B (b)	6010B (b)	Arsenic
6010B (b)	6010B (b)	Barium
6010B (b)	6010B (b)	Beryllium
6010B (b)	6010B (b)	Cadmium
6010B (b)	6010B (b)	Calcium
6010B (b)	6010B (b)	Total Chromium
6010B (b)	6010B (b)	Cobalt
6010B (b)	6010B (b)	Copper
6010B (b)	6010B (b)	Iron
6010B,7420,7421 (b)	6010B,7420,7421 (b)	Lead
6010B (b)	6010B (b)	Magnesium
6010B (b)	6010 (b)	Manganese
7470A (b)	7471A (b)	Mercury
249.2 (a) 6010B (b)	6010B (b)	Nickel
6010B (b)	6010B (b)	Potassium
6010B (b)	6010B (b)	Selenium
6010B (b)	6010B (b)	Silver
6010B (b)	6010B (b)	Sodium
6010B,7840,7841 (b)	6010B,7840,7841 (b)	Thallium
6010B (b)	6010B (b)	Tin

## ANALYTICAL PROCEDURES

TABLE 8.2 (Cont)

### METHOD

WATER	SOIL	PARAMETERS
6010B (b)	6010B (b)	Vanadium
6010B (b)	6010B (b)	Zinc
335.2 (a)	9010B (b)	Cyanide
335.1 (a)	9010B (b)	Amenable Cyanide
413.1 (a)	9070 (b)	Oil & Grease (Gravimetric)
413.2 (a) / 9070 (b)	9070 (b)	Oil & Grease (Infrared)
418.1 (a) / 9073 (b)	8440 (b)	Total Petroleum Hydrocarbons
602(c) / 8021 (b)	8021 (b)	Purgable Aromatics (BTEX)
608 (c) / 8081A (b)	8081A (b)	Organochlorine Pesticides & PCB's
608 (c) / 8082 (b)	8082 (b)	Organochlorine Pesticides & PCB's
624 (c) / 8260B (b)	8260B (b)	Volatiles
625 (c) / 8270C (b)	8270C (b)	Semivolatiles
615 (c) / 8151 (b)	8151 (b)	Chlorinated Herbicides
GRO (g)	GRO (g)	Gasoline Range Organics
DRO (h)	DRO (h)	Deisel Range Organics

## REFERENCES

"Definition and Procedure for the Determination of the Method Detection Limit - Revision 1.11", 40 CFR Part 136, Appendix B.

(a) Methods for Chemical Analysis of Water and Waste, EPA 600 / 4-79 / 020, revised March, 1983.

(b) Methods for the Determination of Metals in Environmental Samples, US. EPA 600 / 4-91 / 010, June 1991.

(c) Test Methods for Evaluating Solid Waste, Physical / Chemical Methods, Third Edition (EPA SW-846), 1986 as amended by Final Update III (December 1996)

(d) Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, US EPA 600/4-82-057, July, 1982.

(e) Manual of Analytical Quality Control for Pesticides and Related Compounds in Human and Environmental Samples, US EPA 600/1-79-008, January, 1979.

(f) Method For Determination of Gasoline Range Organics, State of Tennessee, Department of Environment and Conservation, Division of Underground Storage Tanks, 1993.

(g) Method For Determination of Diesel Range Organics, State of Tennessee, Department of Environment and Conservation, Division of Underground Storage Tanks, 1993.

(h) Leaking Underground Storage Tank (LUST) and Petroleum - Analytical and Quality Assurance Guidance, Wisconsin Department of Natural Resources, July 1993, PUBL-SW-130 93.

### Cleaning of Lab Glassware

The contents of the glassware and containers are first removed manually and properly disposed of. All labels are then removed. A detergent and brush are used to remove any remaining material followed by rinses with tap water, DI water, and (where indicated) solvent rinses. A final rinse by the analyst just prior to analysis is sometimes specified.

#### Reagents:

1. Concentrated Nitric Acid. Instra-analyzed, VWR Cat. No. JT9598-3 or equivalent.
2. 1:1 Nitric Acid. Preparation: Pour 1 L of DI water into a 4-L erlenmeyer flask. Place a Teflon stir bar in the flask and place the flask on a stir plate. Start the stir plate and slowly pour 1 L of concentrated Nitric Acid into the flask. Allow to cool and transfer to a Nalgene wash bottle. Perform the dilution in a hood.  
  
CAUTION: Wear an apron, safety glasses or goggles, rubber gloves, and face shield while handling the nitric acid and performing the dilution. Perform the dilution in a hood.
3. Liquinox concentrate. VWR 21837-027
4. Liquinox cleaning solution. Prepare a 1% solution by diluting 10 ml of concentrate to 1 L or 100 ml to 10 L or any such 1:100 dilution.
5. Methanol. Pesticide residue grade, VWR Cat. No. JT9263-3 or equivalent. Place in Teflon wash bottle only.
6. Sulfuric Acid. Instra-analyzed, VWR Cat. No. JT9673-3 or equivalent.



8. 1:1 Sulfuric Acid. Preparation: Pour 1 L of DI water into a 4-L erlenmeyer flask. Place a Teflon-lined stir bar in the flask and place the flask on a stir plate. Start the stir plate and slowly pour 1 L of concentrated sulfuric acid into the flask. Allow to cool and transfer to a Nalgene wash bottle. Perform the dilution in a hood.

CAUTION: Wear an apron, safety glasses or goggles, rubber gloves, and face shield while handling the sulfuric acid and performing the dilution. Perform the dilution in a hood.

9. Acetone. Technical or histological grade, VWR Cat. No. A134-1.

### PROCEDURE

#### ORGANICS GLASSWARE

A. K-D condenser, flask and receiving vial.

1. Soak and wash in hot water and Liquinox solution.
2. Rinse with tap water.
3. Rinse with acetone.
4. Rinse with methanol.
5. Air dry on rack.
6. Dry in oven at 105°C for one hour.
7. Allow glassware to cool on lab bench.

B. Sodium sulfate drying tube.

1. Allow the tube to remain in the hood at room temperature until the odor of solvent disappears. Use jet spray gun with hot water to dissolve sodium sulfate.
2. Soak and wash tube in hot water and Liquinox cleaning solution.

3. Rinse tube with tap water.
4. Rinse with DI water.
5. Rinse with acetone.
6. Rinse with methanol.
7. Air dry on rack.
8. Dry in oven at 105°C for one hour.
9. Allow glassware to cool on lab bench.

C. Cleaning of miscellaneous glassware.

1. Remove labels and stickers.
2. Soak and wash (with appropriate brush) in hot water and Liquinox solution.
3. Jet rinse with tap water.
4. Rinse with DI water.
5. Rinse with acetone.
6. Rinse with methanol.
7. Air dry on rack.
8. Dry in oven at 105°C for one hour.
9. Allow glassware to cool on lab bench.

D. Florisil clean-up tubes (380mm x 22mm - ID tube with Teflon valve assembly).

1. Remove Teflon valve assembly, place in a vertical position (in a beaker) and allow to drain and dry in the hood until the organic vapor odor is minimal.

2. Wash with hot water to dissolve sodium sulfate.  
(Note: If organic odor is evident, use cold water or allow to remain in hood until organic odor disappears). Wash the sodium sulfate into the sink and down the drain with copious amounts of water.
3. Soak and wash tube in hot water and Liquinox cleaning solution. -
4. Rinse tube with tap water.
5. Rinse with DI water.
6. Rinse with acetone.
7. Rinse with methanol.
8. Air dry on rack.
9. Dry in oven at 105°C for one hour.
10. Allow glassware to cool on lab bench.

### INORGANIC GLASSWARE CLEANING

1. Remove all the labels by sponge or acetone.
2. Wash with hot or cold water and brush to scrub in side of the glassware with suitable laboratory grade detergent(Liquinox or Alconox).
3. Rinse thoroughly with hot tap water, and deionized water.
4. Rinse with 10% Nitric acid, in case of nutrients, rinse with 1:1 Hydrochloric Acid.
5. Rinse with deionized water.
6. Invert and air dry on a laboratory bench.
7. In case of Oil & Grease glassware, follow steps 1-3, rinse thoroughly with acetone, rinse with hot water, and deionized water and bake at 105°C for 3-4 hours.

### OTHER GLASSWARE CLEANING

Water soluble substances are simply washed out with hot or cold water, and the glassware is finally rinsed with successive small amounts of deionized water. Other substances that are difficult to remove may require the use of detergent, organic solvent, dichromate solution, and an acid mixture. After the use of cleaning agent, the glassware is rinsed with hot or cold water, finally with deionized water, and set for drying.

TABLE 8.3

<u>REAGENTS &amp; STANDARD STORAGE</u>	
CHEMICAL	METHOD OF STORAGE
NITRIC ACID	Stored in original containers in vented cabinet designed for acid storage. NOTE: Each acid is stored in a separate cabinet.
HYDROCHLORIC ACID	See Above
SULFURIC ACID	See Above
pH STANDARDS	Stored in cabinet designated for standard and reagent storage. Cabinet in air conditioned area of the laboratory.
AA STANDARDS	Stored in original containers in a cabinet designated for standard storage at room temperature.
ISOPROPANOL	Stored in original containers in vented solvent storage cabinet. NOTE: All solvents used for VOC Analyses are stored in solvent cabinets in the VOC analysis area. No other solvents are stored.
METHANOL	See Above
HEXANE	See Above
METHYLENE CHLORIDE	Stored in original containers in vented solvent storage cabinet.

## Disposal of Wastes

### 1. City sewer

- a. Any materials which are corrosive, moderately to highly toxic, or flammable, will not be admitted to the city sewer system to which the laboratory sinks and other drains are connected.
- b. Rags and other solid trash will not be disposed of through the city sewer system.
- c. Specific instructions for disposal of wastes for the laboratory will be provided by the laboratory manager.

### 2. Waste containers

- a. Containers for liquids will be placed inside each laboratory unit for the disposal of liquids that should be kept out of the sewer system. Extreme caution will be observed that materials placed in this containers are not chemically reactive with other materials in the container. Corrosive acids will not be placed in metal cans but in plastic containers. Strong oxidizing or reducing agents will be handled separately.
- b. Solid waste containers will be placed in each laboratory unit and elsewhere as necessary in the building.
- c. Containers for glass waste will be placed inside each laboratory unit.
- d. Pick up of waste containers when full, or as necessary, will be arranged by contacting the lab manager. The contents of each container will be identified on the tag and particular notation will be made when contents are highly toxic, hazardous or corrosive so that proper and safe disposal procedures can be employed.
- e. Waste disposal of the above types will be coordinated by the lab manager.

3. The chemical waste will be segregated into the following waste types:
- a. Trash, inert materials - non-toxic, non-reactive, non-ignitable, non-corrosive solids.
  - b. Weak aqueous acid solutions (<10% wt.) and related compounds.
  - c. Weak aqueous alkaline solutions (10% wt.) and related compounds.
  - d. Concentrated aqueous acid solutions and related compounds.
  - e. Concentrated aqueous alkaline solutions and related compounds.
  - f. Flammable (flash point, C.C., F <140°F), non-halogenated organic solvents.
  - g. Flammable halogenated organic solvents.
  - h. Non-flammable, non-halogenated organic solvents.
  - i. Non-flammable halogenated organic solvents.
  - j. Inorganic oxidizers, peroxides.
  - k. Organic oxidizers, peroxides.
  - l. Toxic - heavy metals.
  - m. Toxic poisons, herbicides, pesticides, carcinogens.
  - n. Aqueous solutions of reducing agents and related compounds.
  - o. Pyrophobic substances.
  - p. Hydrophoric substances.
  - q. Cyanide, sulfide, ammonia-bearing waste.

- r. Water soluble waste of unknown origin or properties.
  - s. Water insoluble waste of unknown origin or properties.
  - t. Empty containers.
  - u. Asbestos or asbestos containing waste.
  - v. Contaminated lab ware, trash.
4. The following discussed methods may be employed for the pre treatment of waste in the laboratory.
- a. Recovery, reuse - consideration may be given to distillation for the recovery of larger volumes of solvents.
  - b. Conversion, degradation - all persons using chemicals in the laboratory will be generally aware of the toxic properties of the substance(s) used, including consideration of the toxic properties of possible reaction products. In incorporating the following procedures, one will examine the possible hazards associated with each.
  - c. Dilution - many laboratory chemical wastes can be diluted to an extent to allow disposal to the sewer system. Strong acids and bases will be diluted to pH 3-11 for this purpose.
  - d. Neutralization - strong acids and bases will carefully be neutralized to pH 3-11 to render them less hazardous for disposal.
  - e. Oxidation - compounds such as chlorine, cyanide, aldehydes, mercaptans, and phenolics will be oxidized to less toxic and less odoriferous compounds.
  - f. Reduction - in addition to oxidizers and peroxides, various organic chemicals and heavy metal solutions will be reduced to less toxic substances. Aqueous waste containing hexavalent chromium may be reduced to trivalent. Mercury, lead and silver may be removed from aqueous streams by the process of reduction / precipitation. Organo-lead compounds will be removed by the same type of processes.



5. The following discussed method may be employed for the disposal of waste in the laboratory.
  - a. Containerization (dumpster) - this method will be used only in the disposal of inert laboratory solid waste collection. Materials disposed of in this manner must be suitable to sanitary landfill disposal and must be of no threat to the personnel picking up the waste.

### Documentation Procedures for Sample Disposal

1. Sample Log-In (Chain of Custody Procedures)

All samples received at Accura are logged in the Log book. At this time, a lab sample number is designated for each sample and all relevant sample information is listed in the chain of custody sheet. The lab ID number is the key to following ultimate sample disposal or disposition. The explanation for each sample disposal or disposition code is listed in the following section.

2. Description of sample disposal and/or disposal code

Each sample received will be first categorized and subsequently disposed using procedures described below.

#### Category/Sample Disposal

**N/A** - Not Applicable. The samples are analyzed for parameters containing non-hazardous (NH) constituents or for parameters not listed under current governmental regulations (EPA, DNA, City-County). The sample categorized N/A will be disposed using routine laboratory facilities.

**N/D** - Not Detected. The parameter(s) analyzed for the sample are not detected. Consequently, the samples are determined to be non-hazardous (NH) and will be disposed of using routine laboratory facilities.

**D** - Detected. The parameter(s) analyzed for in the sample are detected and quantified. Since the hazardous nature of these samples may not be defined (at present), the sample categorized as "D" (water, soil, oil sludge) are composited in appropriate storage containers for proper landfill disposal.

3. Sample Storage

- a. All samples will be stored 60 days after the final reporting of results in case a question arises about the results.
- b. Samples involved in litigation will be kept in a locked cabinet until the litigation is resolved.
- c. After analysis and before storage, the sample will be clearly labeled with a colored dot that will indicate the kind of disposal required.
  - i. Red Dot = Detectable
  - ii. Green Dot = Non-Detectable

4. Disposal of non-hazardous or non-detectable samples

After 60 days the Accura labels will be removed (except for the disposal tags) and the samples will be disposed of according to the preceding sections.

5. Disposal of hazardous wastes

- a. Solid waste - Solids will be packed in their container in a 55 gallon drum. They will be packed with vermiculite to prevent breakage. Records will be kept on the sample number and the drum into which it is transferred.

A full TCLP Analysis will be done on each drum.

A hazardous waste facility approved by the management will be contacted to remove the drum for proper disposal.

- b. Liquid waste

1. Where compatible, liquids will be consolidated into large containers and then analyzed and sent to a hazardous waste disposal site.
2. As necessary, liquids will be packed in a 55 gallon drum in a manner similar to the solid samples.
3. Records will be kept on the sample number and the drum and container into which it was transferred.
4. An approved hazardous waste facility will be contacted to remove the drum or container.

6. Documentation

- a. Accurate records on the disposition of all waste will be kept current (located in Sample Disposal file).
- b. A record of the method of disposition (name of hazardous waste facility and chain-of-custody) will be kept current (located in the Sample Disposal file).
- c. The manifest approved by EPA will be used.

**Form 8.1**

**WASTE DISPOSAL**

DATE:	
TYPE OF WASTE:	
COMPOSITE/GRAB	
CONTAINER	
TRANSFERRED TO:	
TRANSFERRED BY:	
COMMENTS: _____	
_____	
_____	
_____	
_____	
_____	

SECTION 9.0

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CALIBRATION PROCEDURES AND FREQUENCY

### Instrumentation & Capabilities List

1. Inductively Coupled Argon Plasma  
Accessories: Simultaneous, Auto-sampler
2. Atomic Absorption Spectrophotometers  
Accessories: Flame, Furnace and Cold Vapor

Capabilities: Metal Analysis

- (1) Aluminum
- (2) Antimony
- (3) Arsenic
- (4) Barium
- (5) Beryllium
- (6) Cadmium
- (7) Calcium
- (8) Chromium
- (9) Cobalt
- (10) Copper
- (11) Iron
- (12) Lead
- (13) Magnesium
- (14) Manganese
- (15) Mercury
- (16) Nickel
- (17) Potassium
- (18) Selenium
- (19) Silver
- (20) Sodium
- (21) Thallium
- (22) Tin
- (23) Vanadium
- (24) Zinc

### Instrumentation & Capabilities (Cont'd)

1. 2 Gas Chromatograph / Mass Spectrometers  
Accessories: Quadropole, Jet separator
2. 2 Purge and Traps
3. 2 Auto samplers  
Accessories: 16 Position Sampler  
16 Position Sample Heater

Capabilities: Volatile Organic Analysis

(1) Acetone	(27) 2-Hexanone
(2) Acrolein	(28) Methylene chloride
(3) Acrylonitrile	(29) 4-Methyl-2-Pentanone
(4) Benzene	(30) Styrene
(5) Bromodichloromethane	(31) 1,1,2,2-Tetrachloroethane
(6) Bromoform	(32) Tetrachloroethene
(7) Bromomethane	(33) Toluene
(8) 2-Butanone	(34) 1,1,1-Trichloroethane
(9) Carbon Disulfide	(35) 1,1,2-Trichloroethane
(10) Carbon tetrachloride	(36) Trichloroethane
(11) Chlorobenzene	(37)
Trichlorofluoromethane	
(12) Chloroethane	(38) Vinyl acetate
(13) 2-Chloroethyl vinyl ether	(39) Vinyl chloride
(14) Chloroform	(40) m & p-Xylenes
(15) Chloromethane	(41) o-Xylene
(16) Dibromochloromethane	(42) Xylenes (total)
(17) 1,1-Dichloroethane	
(18) 1,2-Dichloroethane	
(19) 1,1-Dichloroethene	
(20) cis-1,2-Dichloroethene	
(21) trans-1,2-Dichloroethene	
(22) 1,2-Dichloroethene (total)	
(23) 1,2-Dichloropropane	
(24) cis-1,3-Dichloropropene	
(25) trans-1,3-Dichloropropene	
(26) Ethyl benzene	

**Instrumentation & Capabilities List (Cont'd)**

1. 2 Gas Chromatography / Mass Spectrometers  
Accessories: Quadropole
2. 2 Auto samplers  
Accessories: 100 Position Sample Tray

Capabilities: Semivolatile Organic Analysis

- |                                  |                                 |
|----------------------------------|---------------------------------|
| (1) Acenaphthene                 | (35) 4,6-Dinitro-2-methylphenol |
| (2) Acenaphthylene               | (36) 2,4-Dinitrophenol          |
| (3) Anthracene                   | (37) 2,4-Dinitrotoluene         |
| (4) Benzidine                    | (38) 2,6-Dinitrotoluene         |
| (5) Benzoic acid                 | (39) Di-n-octylphthalate        |
| (6) Benzo(a)anthracene           | (40) Fluoranthene               |
| (7) Benzo(b)fluoranthene         | (41) Fluorene                   |
| (8) Benzo(k)fluoranthene         | (42) Hexachlorobenzene          |
| (9) Benzo(g,h,i)perylene         | (43) Hexachlorobutadiene        |
| (10) Benzo(a)pyrene              | (44) Hexachlorocyclopentadiene  |
| (11) Benzyl alcohol              | (45) Hexachloroethane           |
| (12) bis(2-Chloroethoxy)methane  | (46) Indeno(1,2,3-cd)pyrene     |
| (13) bis(2-Chloroethyl)ether     | (47) Isophorone                 |
| (14) bis(2-Chloroisopropyl)ether | (48) 2-Methylnaphthalene        |
| (15) bis(2-Ethylhexyl)phthalate  | (49) 2-Methylphenol             |
| (16) 4-Bromophenyl phenyl ether  | (50) 4-Methylphenol             |
| (17) Butyl benzyl phthalate      | (51) Naphthalene                |
| (18) 4-Chloroaniline             | (52) 2-Nitroaniline             |
| (19) 2-Chloronaphthalene         | (53) 3-Nitroaniline             |
| (20) 4-Chloro-3-methylphenol     | (54) 4-Nitroaniline             |
| (21) 2-Chlorophenol              | (55) Nitrobenzene               |
| (22) 4-Chlorophenyl phenyl ether | (56) 2-Nitrophenol              |
| (23) Chrysene                    | (57) 4-Nitrophenol              |
| (24) Dibenzo(a,h)anthracene      | (58) N-Nitrosodimethylamine     |
| (25) Dibenzofuran                | (59) N-Nitrosodiphenylamine     |
| (26) Di-n-butylphthalate         | (60) N-Nitrosodipropylamine     |
| (27) 1,2-Dichlorobenzene         | (61) Pentachlorophenol          |
| (28) 1,3-Dichlorobenzene         | (62) Phenanthrene               |
| (29) 1,4-Dichlorobenzene         | (63) Phenol                     |
| (30) 3,3'-Dichlorobenzidine      | (64) Pyrene                     |
| (31) 2,4-Dichlorophenol          | (65) 1,2,4-Trichlorobenzene     |
| (32) Diethylphthalate            | (66) 2,4,5-Trichlorophenol      |
| (33) 2,4-Dimethylphenol          | (67) 2,4,6-Trichlorophenol      |
| (34) Dimethylphthalate           |                                 |



**Instrumentation & Capabilities List (Cont'd)**

1. Gas Chromatograph  
Accessories: Dual Electron Capture Detector
2. Auto sampler  
Accessories: 100 Position Sample Tray

Capabilities: Pesticide Residue Analysis  
PCB Analysis  
Herbicide Analysis

- (1) Aldrin
- (2) alpha-BHC
- (3) beta-BHC
- (4) delta-BHC
- (5) gamma-BHC (Lindane)
- (6) Chlordane (technical)
- (7) 4,4'-DDD
- (8) 4,4'-DDE
- (9) 4,4'-DDT
- (10) Dieldrin
- (11) Endosulfan I
- (12) Endosulfan II
- (13) Endosulfan Sulfate
- (14) Endrin
- (15) Endrin Aldehyde
- (16) Endrin Ketone
- (17) Heptachlor
- (18) Heptachlor Epoxide
- (19) Methoxychlor
- (20) Toxaphene
- (21) PCB-1016
- (22) PCB-1221
- (23) PCB-1232
- (24) PCB-1242
- (25) PCB-1248
- (26) PCB-1254
- (27) PCB-1260
- (28) 2,4-D
- (29) 2,4,5-TP (Silvex)

**Instrumentation & Capabilities List (Cont'd)**

1. Infrared Spectrophotometer  
Accessories: Scanning / Variable Range  
  
Capabilities: Total Petroleum Hydrocarbons  
Oil and Grease
  
2. UV / VIS Spectrophotometer  
  
Capabilities: Total Cyanide  
Amenable Cyanides  
Total Phenolics

### Standards and Tractability

All chemicals used as calibration standards in the analysis of organics and metals are purchased from reputable companies that trace their standards to NBS and ASTM. Typically, the purity range for analytical standards is 97% to 99+%, depending on the particular compound. Certificates of analysis and lot numbers (where applicable) are kept on file at AAL for reference. Also, expiration dates are monitored to ensure unstable compounds are replaced as needed.

The following more extensive references are consulted for detailed information associated with the preparation, storage and characterization of chemicals used as stock standards.

Supelco  
Supelco Park  
Bellefonte, PA 16823

Eastman Kodak Chemical  
P.O. Box 92894  
Rochester, NY 14692-9939

PCR Research Chemical, Inc.  
P.O. Box 1778  
Gainesville, FL 32602

Baxter Scientific  
1750 Stone Ridge Drive  
Stone Mountain, GA 30021

Chem Service, Inc.  
P.O. Box 3108  
West Chester, PA 19380

Fisher Scientific  
2775 Pacific Drive  
Norcross, GA 30091

Restek Corporation  
Penn Eagle Industrial Park  
110 Benner Circle  
Bellefonte, PA 16823-8812

AccuStandard, Inc.  
25 Science Park  
New Haven, CT 06511

High Purity Standards  
P.O. Box 30188  
Charleston, SC 29417

**TABLE 9.1**

<b><u>STANDARD SOURCE &amp; PREPARATION</u></b>	
INSTRUMENT GROUP:	Inductively Coupled Argon Plasma Emission Spectrophotometer
STANDARD SOURCES:	High Purity Standards
HOW RECEIVED:	Multi-element Standards - 100 ppm to 1000 ppm
SOURCE STORAGE:	Room Temperature
PREPARATION FROM SOURCE:	Primary Stocks      100 ppm - 1000 ppm Intermediate Stocks      10 ppm - 100 ppm Working Stocks      as needed
LAB STOCK STORAGE:	Primary Stocks      2-5% HNO <sub>3</sub> Intermediate Stocks      0.15% HNO <sub>3</sub> Working Stocks      0.15% HNO <sub>3</sub>
PREP FREQUENCY:	Primary Stocks      Annually Intermediate Stocks      Semi-annual or as needed Working Stocks      as needed

**TABLE 9.2**

<b><u>STANDARD SOURCE &amp; PREPARATION</u></b>	
INSTRUMENT GROUP:	Atomic Absorption Spectrophotometer
STANDARD SOURCES:	Fisher Scientific Baxter Scientific
HOW RECEIVED:	Solution of 1000 ppm
SOURCE STORAGE:	Room Temperature
PREPARATION FROM SOURCE:	Primary Stocks 1000 ppm Intermediate Stocks 1 ppm to 100 ppm Working Stocks as needed
LAB STOCK STORAGE:	Primary Stocks 0.15% HNO <sub>3</sub> Intermediate Stocks 0.15% HNO <sub>3</sub> Working Stocks 0.15% HNO <sub>3</sub>
PREP FREQUENCY:	Primary Stocks Annually Intermediate Stocks Semi-annual or as needed Working Stocks as needed

**TABLE 9.3**

<b><u>STANDARD SOURCE &amp; PREPARATION</u></b>	
<b>INSTRUMENT GROUP:</b>	Gas Chromatograph/Mass Spectrometer
<b>STANDARD SOURCES:</b>	Accu Standard Supelco Chem Service
<b>HOW RECEIVED:</b>	Solution of 200 ppm for purgeables  Solution of 2000 ppm for extractables
<b>SOURCE STORAGE:</b>	Freezer for purgeables  Refrigerator for extractables
<b>PREPARATION FROM SOURCE:</b>	Primary Stocks 200 ppm for purgeables 2000 ppm for extractables Working Stocks 20-200 ppb for purgeables 20-160 ppm for extractables
<b>LAB STOCK STORAGE:</b>	Freezer -16°C for purgeables  Refrigerator 4°C for extractables
<b>PREP FREQUENCY:</b>	Primary Stocks (1) Semi-annual or sooner if check standards indicate a problem for extractables. (2) Monthly or sooner if check standards indicate a problem for purgeables. Calibration Standards (1) 7-15 days or sooner if comparison with check standards indicates a problem for purgeables. (2) All standards prepared once a year or sooner if check standards indicate a problem. Weekly or daily calibration standard.

**TABLE 9.4**

<b><u>STANDARD SOURCE &amp; PREPARATION</u></b>		
<b>INSTRUMENT GROUP:</b>	Gas Chromatograph	
<b>STANDARD SOURCES:</b>	Accu Standard Supelco Restek Chem Service	
<b>HOW RECEIVED:</b>	Solution of 2000 ppm for pesticide mix Solutions of 200 - 5000 ppm for PCB mix Solutions of 100 - 500 ppm for herbicides	
<b>SOURCE STORAGE:</b>	Refrigerator (at 4°C)	
<b>PREPARATION FROM SOURCE:</b>	Primary Stocks- 2000 ppm for pesticides Secondary Stocks- 10 ppm for pesticides Working Stocks- 0.1 to 5.0 ppm for pesticides Primary Stocks- 200-5000 ppm for PCB's Secondary Stocks- 100-200 ppm for PCB's Working Stocks- 1 to 8 ppm for PCB's Primary Stocks- 100 - 500 ppm for herbicides Working Stocks- 0.1 to 100 ppm for herbicides	
<b>LAB STOCK STORAGE:</b>	Refrigerator	4°C
<b>PREP FREQUENCY:</b>	Primary Stock	Annually
	Working Stocks	Quarterly or as needed

**TABLE 9.5**

<b><u>STANDARD SOURCE &amp; PREPARATION</u></b>	
INSTRUMENT GROUP:	UV / VIS Spectrophotometer
STANDARD SOURCES:	Fisher Scientific Baxter Scientific
HOW RECEIVED:	Solution of 1000 ppm Neat materials of 99.9% + purity
SOURCE STORAGE:	Room Temperature Refrigerator (at 4°C)
PREPARATION FROM SOURCE:	Primary Stocks 1000 ppm Intermediate Stocks 10 ppm Working Stocks as needed
LAB STOCK STORAGE:	Room Temperature
PREP FREQUENCY:	Primary Stocks Annually Intermediate Stocks Quarterly or as needed Working Stocks as needed



**TABLE 9.6**

<b><u>STANDARD SOURCE &amp; PREPARATION</u></b>	
INSTRUMENT GROUP:	Infrared Spectrophotometer
STANDARD SOURCES:	Fisher Scientific Baxter Scientific
HOW RECEIVED:	Neat materials 99.9% + purity
SOURCE STORAGE:	Refrigerator (at 4°C)
PREPARATION FROM SOURCE:	Primary Stocks 10000 ppm Intermediate Stocks 500 ppm Working Stocks 1 - 50 ppm or as needed
LAB STOCK STORAGE:	Refrigerator (at 4°C)
PREP FREQUENCY:	Primary Stocks Semi-annually Intermediate Stocks Quarterly or as needed Working Stocks as needed

**TABLE 9.7**

<b><u>INSTRUMENT CALIBRATION</u></b>	
INSTRUMENT:	Inductively Coupled Argon Plasma Emission Spectrophotometer
STANDARD SOURCES:	High Purity Standards
# OF STANDARDS/ INITIAL STANDARDIZATION	1 Blank and 1 Concentration Level Standard.
ACCEPTANCE/REJECTION CRITERIA- INITIAL STANDARDIZATION	A Standardization within $\pm 10\%$ of the true values of a QC standard analysis.
FREQUENCY:	Daily prior to use or failure of concentration calibration.
# OF STANDARDS/ CONCENTRATION CONTINUING CALIBRATION:	1 QC Standard
ACCEPTANCE/REJECTION CRITERIA - CONCENTRATION STANDARDIZATION:	Concentration within 10% of known value
FREQUENCY:	Initial and every 10 samples

**TABLE 9.8**

<b><u>INSTRUMENT CALIBRATION</u></b>	
INSTRUMENT:	Atomic Absorption Spectrophotometer
STANDARD SOURCES:	Fisher Scientific Baxter Scientific
# OF STANDARDS/ INITIAL CALIBRATION:	3
ACCEPTANCE/REJECTION CRITERIA- INITIAL CALIBRATION:	Linear regression correlation coefficient of > 0.9998
FREQUENCY:	Daily prior to use or failure of continuing calibration.
# OF STANDARDS/ CONTINUING CALIBRATION:	1 and a QC Sample
ACCEPTANCE/REJECTION CRITERIA - CONTINUING CALIBRATION:	Concentration Within 5% of known value (Mid - Range)
FREQUENCY:	Initial and every 10 samples

**TABLE 9.9**

<b><u>INSTRUMENT CALIBRATION</u></b>	
INSTRUMENT:	Gas Chromatograph / Mass Spectrometer
STANDARD SOURCES:	Supelco Chem Service Accu Standard
# OF STANDARDS/ INITIAL CALIBRATION:	Volatile Organics      5  Extractables              5
ACCEPTANCE/REJECTION CRITERIA- INITIAL CALIBRATION:	Percent Relative Standard Deviation (%RSD) for each Calibration Check Compound (CCC) should be less than 30% .
FREQUENCY:	Monthly or sooner if calibration check indicates a problem.
# OF STANDARDS/ CONCENTRATION CONTINUING CALIBRATION:	Volatile Organics      1  Extractables              1
ACCEPTANCE/REJECTION CRITERIA - CONCENTRATION CALIBRATION:	Concentration within 20% of known value (Mid-Range Concentration) for volatile organics and semi-volatile organics.
FREQUENCY:	Initial and every 10 samples for volatile organics and semi-volatile organics.

**TABLE 9.10**

<b><u>INSTRUMENT CALIBRATION</u></b>	
INSTRUMENT:	Gas Chromatograph
STANDARD SOURCES:	Supelco Restek Accu Standard Chem Service
# OF STANDARDS/ INITIAL CALIBRATION:	Pesticides      5 PCB's            5 Herbicides      5
ACCEPTANCE/REJECTION CRITERIA- INITIAL CALIBRATION:	Linear Regression Correlation Coefficient of > 0.995 or < 20% RSD.
FREQUENCY:	Pesticides      Daily PCB's            Daily Herbicides      Daily
# OF STANDARDS/ CONCENTRATION CALIBRATION:	Pesticides      3 PCB's            1 Herbicides      1
ACCEPTANCE/REJECTION CRITERIA - CONCENTRATION CALIBRATION:	Concentration within 15% of known value (Mid-Range Concentration) for pesticides, PCB's & herbicides.
FREQUENCY:	Initial and every 10 injections.

**TABLE 9.11**

<b><u>INSTRUMENT CALIBRATION</u></b>	
INSTRUMENT:	UV / VIS Spectrophotometer
STANDARD SOURCES:	Fisher Scientific Baxter Scientific
# OF STANDARDS/ INITIAL CALIBRATION:	5
ACCEPTANCE/REJECTION CRITERIA- INITIAL CALIBRATION:	Linear Regression Correlation Coefficient of > 0.985
FREQUENCY:	Daily prior to use or failure of concentration calibration.
# OF STANDARDS/ CONCENTRATION CALIBRATION:	1 and a QC Sample
ACCEPTANCE/REJECTION CRITERIA- INITIAL CALIBRATION:	Concentration within 10% of known value
FREQUENCY:	Initial and every 10 samples

**TABLE 9.12**

<b><u>INSTRUMENT CALIBRATION</u></b>	
INSTRUMENT:	Infrared Spectrophotometer
STANDARD SOURCES:	Fisher Scientific Baxter Scientific
# OF STANDARDS/ INITIAL CALIBRATION:	5
ACCEPTANCE/REJECTION CRITERIA- INITIAL CALIBRATION:	Linear Regression Correlation Coefficient of > 0.985
FREQUENCY:	Daily prior to use or failure of concentration calibration.
# OF STANDARDS/ CONCENTRATION CALIBRATION:	1 and a QC Sample
ACCEPTANCE/REJECTION CRITERIA- INITIAL CALIBRATION:	Concentration within 10% of known value
FREQUENCY:	Initial and every 10 samples

**TABLE 9.13**

<b><u>CALIBRATION FREQUENCY</u></b>	
INSTRUMENT:	Inductively Coupled Argon Plasma Emission Spectrophotometer
CALIBRATION TYPE:	Initial Continuing Daily
# OF STANDARDS	Initial      1 Blank and 1 Concentration Level Standard Continuing    1 Standard QC Sample
TYPE OF CURVE:	Linear
ACCEPTANCE/REJECTION CRITERIA	1 Standard and QC Sample - $\pm 10\%$ of value
FREQUENCY:	Initial Calibration Daily  Continuing calibration for every 10 samples



**TABLE 9.14**

<b><u>CALIBRATION FREQUENCY</u></b>	
<b>INSTRUMENT:</b>	Atomic Absorption Spectrophotometer
<b>CALIBRATION TYPE:</b>	Initial Continuing
<b># OF STANDARDS</b>	Initial      3 Concentration Levels Continuing    1 Standard
<b>TYPE OF CURVE:</b>	Linear
<b>ACCEPTANCE/REJECTION CRITERIA</b>	3 Concentration Levels      Linear regression correlation coefficient of > 0.9998. 1 Standard $\pm 5\%$ of value
<b>FREQUENCY:</b>	Initial Calibration Daily Continuing calibration for every 10 samples

**TABLE 9.15**

<b><u>CALIBRATION FREQUENCY</u></b>	
<b>INSTRUMENT:</b>	Gas Chromatograph/Mass Spectrometer
<b>CALIBRATION TYPE:</b>	I = Initial C = Continuing D = Daily
<b># OF STANDARDS</b>	Initial      5 Concentration Levels  Continuing/ Daily      1 Standard 50 ppb for purgeables 50 ppm for extractables
<b>TYPE OF CURVE:</b>	Linear
<b>ACCEPTANCE/REJECTION CRITERIA</b>	Initial      5 Concentration Levels Percent Relative Standard Deviation (% RSD) should be less than 30%  Continuing/ Daily      Percent of each calibration check compound (CCC) difference should be less than 20% for the initial calibration to be valid.
<b>FREQUENCY:</b>	Initial      (VOA's) 5 Concentration Levels monthly or if calibration check standards indicate a problem for purgeables. Continuing      Daily 1 Concentration Standard for volatile organics  Initial      (Semi-VOA's) 5 Concentration Levels Monthly or if calibration check standards indicate a problem for extractables. Continuing      Daily 1 Concentration Standard for semi-volatile organics

**TABLE 9.16**

<b><u>CALIBRATION FREQUENCY</u></b>	
<b>INSTRUMENT:</b>	Gas Chromatograph
<b>CALIBRATION TYPE:</b>	Initial Continuing Daily
<b># OF STANDARDS</b>	Initial      5 Concentration Levels Daily      1 Mid-Level Standard Continuing      1 Standard (Mid- Level)
<b>TYPE OF CURVE:</b>	Linear
<b>ACCEPTANCE/REJECTION CRITERIA</b>	5 Concentration Levels      20 % RSD Daily      15% Difference Continuing      15% Difference
<b>FREQUENCY:</b>	Initial 5 Concentration Levels      Monthly or if CC fails Daily - 1 Standard at begining of batch Continuing - 1 Standard per 10 injections

**TABLE 9.17**

<b><u>CALIBRATION FREQUENCY</u></b>	
INSTRUMENT:	UV / VIS Spectrophotometer
CALIBRATION TYPE:	Initial Continuing
# OF STANDARDS	Initial 5 Concentration Level Continuing 1 Standard
TYPE OF CURVE:	Linear
ACCEPTANCE/REJECTION CRITERIA	5 Concentration Levels      99.985 CV 1 Standard $\pm 10\%$ Difference
FREQUENCY:	Initial Calibration Daily Continuing calibration for every 10 samples

**TABLE 9.18**

<b><u>CALIBRATION FREQUENCY</u></b>	
INSTRUMENT:	Infrared Spectrophotometer
CALIBRATION TYPE:	Initial Continuing
# OF STANDARDS	Initial 5 Concentration Level Continuing 1 Standard
TYPE OF CURVE:	Linear
ACCEPTANCE/REJECTION CRITERIA	5 Concentration Levels      99.985 CV 1 Standard $\pm 10\%$ of value
FREQUENCY:	Initial Calibration Daily Continuing calibration for every 10 samples

Table 9.19

## ANALYTICAL LABORATORY EQUIPMENT

EQUIPMENT DESCRIPTION	MODEL NUMBER	COMMENTS
<b>INSTRUMENTATION</b>		
Gas Chromatograph/Mass Spectrometer	HP 5890 and HP 5970	Quadrupole - Volatile Organic System
Gas Chromatograph/Mass Spectrometer	HP 5890 and HP 5970	Quadrupole - Semi-Volatile Organic System
Gas Chromatograph/Mass Spectrometer	HP 5890 and HP 5972	Quadrupole - Volatile Organic System
Gas Chromatograph/Mass Spectrometer	HP 5890 and HP 5892	Quadrupole - Semi - Volatile Organic System
Ionization Gauge Controller	GP 330	
HP Gas Chromatograph	HP 5890	Dual Electron Capture Detector
HP Gas Chromatograph	HP 5890	Photo Ionization and Flame Ionization Detector
HP Gas Chromatograph (OI Analytical)	HP 5890	Photo Ionization and Flame Ionization Detector
HP Gas Chromatograph	HP 5840	Electron Capture and Flame Ionization Detector
Hewlett Packard Printer	HP 2934	
Hewlett Packard Tape Drive	HP 9145	
Hewlett Packard Computer	HP 100 OA	
Hewlett Packard MS Chem Station	Version: C.02.00	Data Handling System
Hewlett Packard Chem Station (Qty - 5)	Version: A.03.21	Data Handling System
Hewlett Packard Autosampler (Qty - 4)	HP 7673	100 Position Sample Tray
OI Analytical Sample Concentrator	4560	Liquid Sample Concentrator
OI Analytical Autosampler	MPM-16	16 Position Sample Purger
Tekmar Purge and Trap	LSC 2000	Liquid Sample Concentrator
Tekmar Purge and Trap	LSC 3000	Liquid Sample Concentrator
Tekmar Purge and Trap	LSC 2	Liquid Sample Concentrator
Tekmar Autosampler	ALS 10	10 Position Sample Purger
Tekmar Autosampler (Qty - 2)	ALS 2016	16 Position Sample Purger
Tekmar Multiple Heater Concentrator (Qty - 2)		16 Position Sample Heater

**Table 9.19**  
**ANALYTICAL LABORATORY EQUIPMENT (Cont'd)**

EQUIPMENT DESCRIPTION	MODEL NUMBER	COMMENTS
<b>INSTRUMENTATION (Cont'd)</b>		
Infrared Spectrometer	PE 1420	Variable Range
UV/VIS Spectrophotometer	Welch Chem Anal	
Inductively Coupled Argon Plasma Unit	ICAP 61E - Simultaneous	Thermo Jerall Ash
Atomic Absorption Spectrophotometer	PE 4100 ZL	Furnace, Flame, EDL
Atomic Absorption Spectrophotometer	PE 372	Furnace, Flame
Atomic Absorption Spectrophotometer	PE 372	Hydride Generator
Mercury Analyzer	PE	Cold Vapor
UV/VIS Spectrophotometer	Spectronic 20	Bauch & Lomb
<b>EXTRACTION / DIGESTION EQUIPMENT</b>		
Soxhlet Extraction System		
Seperatory Funnals	100ml , 250ml , 500ml , 1Lt , 2Lt	
Continuous Liquid\Liquid Extraction System		
Zero Headspace Extractor (4)		Millipore
TCLP Extractor	10 Position	Analytical
Lars Lande Rotary Extractor	10 Position	Analytical
Microwave Digestor	MDS 2100	CEM
pH/Ion Meter	Accumet 925	Fisher Scientific
pH Meter	420 A	Orion
Conductivity Meter	HI 8033	Hanna Instruments
Sonicator		Tekmar
Sonicator Horn		Tekmar

Table 9.19

## ANALYTICAL LABORATORY EQUIPMENT (Cont'd)

EQUIPMENT DESCRIPTION	MODEL NUMBER	COMMENTS
<b>RELATED EQUIPMENT</b>		
Sonicator Converter		Tekmar
Water Bath	Model 224	Allied Fisher
Zymark Turbovap Concentrator	Turbovap II	Sample Concentrator
Analytical Balance	Galaxy 1200	Ohaus
Analytical Balance	I	Mettler
Analytical Balance	Dial-O-Gram	Ohaus
Thermometer	NBS	Fisher Science
Magnetic Stirrer	PC 353	Corning
Magnetic Stirring Hot Plate	PC 351	Corning
Stir Plate	Type 1000	Corning
Hot Plate	Presto	Sanyo
SVO/Pesticide Freezer		
Sample Receiving Refridgerator		
Sample Storage Refridgerator		
Safty Flow Lab Fume Hood		Fisher Scientific
Safty Flow Lab Fume Hood		Fisher Scientific
Centrifuge		International Equipment
Oven	17	Precision
Oven	Blue 17	Blue 17
Furnace	Type 1400	Thermolyne
Ultrasonic Cleaner	B-52	Branson



## **SECTION 10.0**

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### **PREVENTATIVE MAINTENANCE**

## Preventive Maintenance

**Table 10.1**

INSTRUMENT	PROCEDURE	FREQUENCY
Analytical Balances	Clean pans and compartment Check alignment and balance Check zero Check standardized weights Full calibration and adjustment	Daily before and after use Daily Daily Monthly Annually
pH Meters	Clean pH probes Change DI water for rinsing Change buffer solutions Calibrate using buffers at pH 4,7, and 10	Daily before and after use Daily Weekly Daily
Atomic Absorption Spectrophotometers Flame	Check burner heads Clean burner heads Check aspiration tubing Check / Inspect optics  Clean optics Check gases Full Servicing and adjustment.	Daily Monthly or as needed Daily / Annually (On contract) Quarterly or as needed Daily Annual
Atomic Absorption Spectrophotometers Furnace	Clean furnace windows Check plumbing connection Check graphite tube Change graphite tube  Check / Inspect optics  Clean optics Check gases Full servicing and adjustment.	Monthly or as needed Daily Daily Daily or as needed (approx. every 30 analyses) Daily / Annually (On contract) Quarterly or as needed Daily Annual
Infrared Spectrophotometer	Clean instrument housing Clean windows Clean cells Full servicing and adjustment	Monthly Monthly Bi-weekly Annual
UV / VIS Spectrophotometer	Clean instrument compartments Clean windows Clean cuvettes Full servicing and adjustment Replace lamps	Monthly Monthly After each use Annual As needed for replacement

### Preventive Maintenance (Cont'd)

**Table 10.1**

INSTRUMENT	PROCEDURE	FREQUENCY
Inductively Coupled Argon Plasma Emission Spectrophotometer	Check nebulizer Clean nebulizer Check aspiration tubing Check Liquid Argon tank Clean mixing chamber Clean plasma torch Clean filters Check vacuum Change H <sub>2</sub> O coolant filter Full servicing and adjustment	Daily As needed Daily Daily As needed As needed Monthly Every 6 months or as needed Every 6 months or as needed Annual or as needed
Automatic Samplers Hewlett Packard 7673 100 position sample trays	Check syringe plunger Check syringe needles Check sample rinse vials (all 4) Check needle guides and supports Check robotic arm alignments Vacuum, dust or wipe sample trays, robotic arm, injector housing, etc.. Disassemble and clean robotic arm	Daily Daily Daily Monthly or as needed Monthly or as needed Bi-monthly or as needed  Annually or as needed
Purge and Trap Devices Tekmar LSC-2000 Liquid Sample Concentrator	Check purge flows Check for leaks Check traps for purging efficiency Change traps Trap Cleanup (bake out)  Change trap ferrules	Monthly or as needed Monthly or as needed Monthly or as needed Every 6 Months or as needed After analysis of highly contaminated sample Every time trap is changed
Automatic Samplers Tekmar ALS-2016 16 position automatic sampler	Check for leaks Check purge flows Check valve alignments Check for sample line contamination Check for plugged sparge needles Check sample 3-port valve	Monthly Monthly Monthly Daily Daily or after soil sample analysis Weekly or as needed

Preventive Maintenance (Cont'd)

Table 10.1

INSTRUMENT	PROCEDURE	FREQUENCY
Gas Chromatograph Hewlett Packard 5890 Series II	Check or change septums	Daily or as needed
	Check or change injection liners	Daily or as needed
	Check or change gas cylinders	Daily or as needed
	Check in-line gas oxygen/moisture traps	Bi-weekly - Change as needed
	Check system for gas leaks	Monthly or as needed
	Check ECDs for leaks and cleaning	Monthly for leaks / 6 months for cleaning - cotton swipe test
	Check all GC temperature zones	Daily or as needed
	Clean injection ports	Monthly or as needed
	Remove first foot of column or pre- column	Every 6 months or as standard peak tailing is present
	Check column connections for leaks	Monthly or when any column repair work is performed
	Check column carrier gas flows	Monthly or as needed
	Check detector and makeup gas flows	Monthly or as needed
	Check jet-separator for leaks	Monthly or as needed
		Monthly or as needed

**Preventive Maintenance (Cont'd)**

**Table 10.1**

INSTRUMENT	PROCEDURE	FREQUENCY
Mass Selective Detectors Hewlett Packard 5970	Check and refill calibration sample vial with PFTBA	Every 2-3 months or as needed
	Check oil level in mechanical pump	Weekly
	Change oil in mechanical pump	Every 6 months or as needed
	Change oil in turbomolecular pump	Every 6 months
	Check Ion source and analyzer	Daily by calibration checks
	Clean Ion source and analyzer	Quarterly or as needed
	Check mass calibration	
	Bromofluorobenzene (BFB)	Daily
	Decafluorotriphenylphosphine (DFTPP)	Daily
	Check vacuum pump pressure	Daily
	Check system for leaks	Daily

## PREVENTIVE MAINTENANCE DOCUMENTATION

Every instrument at AAL has it's own independent maintenance log book. When ever any type of work is performed on any equipment, it is logged in, dated and initialed along with a detailed explanation of the type of maintenance or repairs. Any recommended repairs or foreseen repairs to be needed will also be logged in for future reference. Log books are bound books and for a single instrument only, they are never combined.

## CONTINGENCY PLANS

Instrument failure is very common in laboratory practices. Contingency plans are essential in order to meet client deadlines and avoid work accumulation.

Accura Analytical Laboratory, Inc., is prepared to meet situations such as instrument failure and rush work. Recent additions of additional GC/MS, GC-FID/PID and GC-Dual ECD instruments to our organic section have increased our capabilities and work as instrument backs up in case of instrument failure.

Accura Analytical Laboratory, Inc., has added an additional ICP and atomic absorption spectrophotometer to strengthen our inorganic division. This not only increases our metal capabilities, but also serves as a back up in case of instrument failure. ...

Accura Analytical Laboratory, Inc., invalidates any questionable data if instruments are not functioning properly. The analyst will check the same data with another instrument, if the generated data is not within 10% of the original data, then all data is invalidated and the analyst repeats the entire analysis.

SECTION 11.0

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QUALITY CONTROL CHECKS

## QUALITY CONTROL PROCEDURES

### Introduction and Objectives

Quality control in the context of this manual connotes procedures utilized to assure the accuracy and precision of analytical chemistry results. At the same time, the manual includes procedures for safeguards against contamination of samples from the time of sampling to the time of delivery to the analytical laboratory. The complex nature and pitfalls of analytical chemistry procedures requires a set of built-in controls to prevent or detect incorrect results.

The objective of quality control is to minimize the output of unreliable and invalid analytical data. The importance of this cannot be overemphasized. Qualitative and quantitative determinations of priority pollutants or other toxic substances are utilized for such important tasks as regulatory surveillance or monitoring of their levels in the environment.

### Internal Quality Control Procedures

To monitor the performance of the analytical system from sampling to analysis, a number of control samples are introduced into the train of actual samples.

- (a) One method reagent blank per sample set will be prepared and analyzed to verify there are no interferences in the procedure.
- (b) QC Check standards (will serve as continuing calibration standards) are analyzed at the beginning of each run to verify the standard curve and at a continuing frequency of 10% to insure the continuing validity of the curve.
- (c) Matrix spikes are prepared and analyzed at a minimum frequency of 5% of all samples for a given analysis or at a rate of one every thirty days, whichever is more frequent. This includes all work submitted to DER.
- (d) Duplicate samples or matrix spike duplicates are analyzed at a minimum rate of 5% of all samples for a given analysis or at a rate of one every thirty days, whichever is more frequent.
- (e) The effectiveness of the method is monitored with reagent water/reagent matrix spikes (blank spike / Laboratory Control Sample). These are performed at a frequency of one per day or every 20 samples, whichever is more frequent.
- (f) Blind QC check samples (performance evaluation samples) are performed semiannually in duplicate. If QC data is not acceptable, the results will be reported to DER in the QA report.



(g) Surrogate spikes are added to each sample for all organic methods. Internal standards are used in each sample to be analyzed for volatile or semi-volatile organic parameters.

If the method Quality Control requirements are more stringent than those listed above, the method requirements will be followed.

Precision, accuracy, and method detection limits are assessed by the use of various equations and statistical procedures. The specific methodologies are given in the appropriate sections below.

Precision addresses the reproducibility of the results, whereas accuracy is a function of the validity of the results as compared to known values. Both are required for a measurement system to be in control. If either one is missing, the sample must be reanalyzed to maintain the laboratory's goal of producing legally defensible results. A summary of the laboratory Quality Assurance Target Methods is shown in Table 11.2.

### Definitions

**Trip Blanks** -- Reagent water placed in a sample container to accompany other sample containers to and from the field. These samples can be used to detect any contamination or cross-contamination during handling and transportation.

**Field Reagent Blanks** -- Reagent water placed in a sample container and treated as a sample in all respects, including contact with sampling equipment under field conditions, storage, preservation and all analytical procedures. The purpose is to determine if method analytes or other interferences are present in the field environment as contamination of sampling equipment, cross-contamination from previously collected samples, or sampling condition contamination.

**Field Replicates** -- Replicate samples are usually collected in duplicate and at specified frequencies for the purpose of documenting precision. Two separate samples collected at the same time are placed under identical circumstances and treated exactly the same throughout field and laboratory procedures. The precision resulting from the analysis of duplicates is a function of the variance of the waste composition, sampling technique, preservation, storage methodology, and laboratory procedures.

**Field Samples** -- Representative samples of a material collected from any source for which determination of composition or contamination is requested. These may be referred to as environmental samples and consist of many matrices such as water, soil, sludge, solid waste, etc. **Field Spiked Samples** -- These are not used frequently due to their susceptibility to error in preparation and potential for contamination of sampling equipment. Also, poor field spike recoveries are difficult to interpret due to the increased possibility for loss of analytes or gain of analytes from the sampling environment.

**Laboratory Reagent Blanks** -- An aliquot of reagent water that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, surrogates, and spike materials that are used with other samples. This blank is used to determine if method analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.

**Laboratory Fortified (Spiked) Blanks** -- An aliquot of reagent water to which known quantities of the method analytes are added in the laboratory. This sample is analyzed exactly like a sample, and its purpose is to determine if the methodology is in control, and whether the laboratory is capable of making accurate and precise measurements at the required method detection limits. This is commonly referred to as a Blank Spike or Laboratory Control Sample.

**Laboratory Duplicates** -- Samples prepared by dividing a presumably homogeneous sample into two or more separate aliquots in the laboratory and analyzed separately with identical procedures. Analysis of these aliquots gives a measure of the precision associated with laboratory procedures.

**Laboratory Fortified (Spiked) Sample Matrix** -- An aliquot of a field sample to which known amounts of the method analytes are added in the laboratory and then analyzed exactly like any other sample. This is done to determine whether the sample matrix contributes bias to the analytical results. Background concentrations of the analytes are determined by the analysis of a separate aliquot of the sample matrix and the values of the fortified sample are corrected for these background concentrations. These samples are commonly referred to as matrix spike/matrix spike duplicates.

**Quality Control Sample (QCS)** -- An aliquot of reagent water or field sample to which has been added analytes of interest from an independent source in order to monitor the laboratory performance of the analytical method. The QCS matrix should match the matrices of the sample with which it is analyzed. Included in this group are laboratory control samples, performance evaluation samples, quality control check standards, and reference samples.

### Assessment of Precision

The estimate of precision may be measured by the use of the standard deviation of a series of replicate measurements.

The mean of a series of replicate measurements of concentration  $X_i$  is calculated as:

Where:  $\bar{X}$  = the mean of  $n$  values  
 $X_i$  = each individual value to calculate the mean  
 $n$  = the total number of replicate measurements.

$$\bar{X} = \frac{\sum X_i}{n}$$

The standard deviation is then calculated as:

$$\text{Variance (SD}^2\text{)} = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1}$$

$$\text{Standard Deviation (SD)} = (\text{SD}^2)^{1/2}$$

An estimate of the precision of a series of replicate measurements is then expressed as the relative standard deviation (RSD), where:

$$\% \text{ RSD} = \frac{\text{SD}}{\bar{X}} \times 100$$

An estimate of the precision of duplicate measurements may then be expressed as the relative percent difference (RPD), where:

$$\text{RPD} = \frac{|X_1 - X_2|}{\bar{X}} \times 100$$

Acceptable values for the RPD, RSD, and SD are usually found in the methods used for analysis. Where acceptable values are not found, the Accura Analytical Laboratory (AAL) goal will be utilized.

It is the goal of AAL to maintain a RPD of less than 20% to 30% and a RSD of less than 20% on all sample results through proper use of analytical and preventative maintenance procedures. These goals will be used while AAL is generating target data.

### Assessment of Accuracy

Accuracy may be evaluated by comparing analytical values to the true values of the spiked samples. When these spiked samples are performance evaluation samples or reference materials, the statistical assessment is performed by third party personnel with the data provided to the laboratory for review and corrective action where warranted.

Accuracy is also evaluated by comparing the mean recovery of surrogate compounds or spiked analytes to the goals specified in the methods. The percent recovery of a surrogate or spiked analyte is defined as:

$$\% \text{ RECOVERY} = \frac{\text{SURROGATE/ANALYTE FOUND}}{\text{SURROGATE/ANALYTE ADDED}} \times 100$$

Where the amount of analyte originally present in the sample is subtracted from the final amount of analyte found in the sample before calculation is begun.

An accuracy assessment is made by the use of a percent recovery interval as a range of values calculated by:

$$\text{RANGE} = X_p \pm 2 \text{ SD}_p$$

Where  $X_p$  stands for the percent recovery and  $\text{SD}_p$  equals the standard deviation of the percent recovery of the analyte of interest.

This accuracy assessment is performed on a regular basis and compared to acceptable method ranges.

When Quality Control samples are analyzed, the results are used to calculate laboratory control limits. These control limits are calculated as:

$$\text{LOWER WARNING LIMIT} = X - 2\text{SD}$$

$$\text{UPPER WARNING LIMIT} = X + 2\text{SD}$$

$$\text{LOWER CONTROL LIMIT} = X - 3\text{SD}$$

$$\text{UPPER CONTROL LIMIT} = X + 3\text{SD}$$

Where X may represent the mean concentration or the mean percent recovery of the analyte in the sample. The standard deviation (SD) is calculated in the manner shown previously.

Laboratory warning and control limits established in this manner reflect approximately the 99% and 95% confidence limits, respectively. Whenever the analytical result is within the warning limits, work will proceed as normal. When the result is between the warning limit and the control limit, analysis can proceed with caution while the analyst is attempting to determine any potential source of problem or error. When the result is outside the control limits, analysis will cease until corrective action has been taken.

It is the goal of AAL to maintain a % recovery of less than 120% and of more than 80% on all sample results through proper use of analytical and preventative maintenance procedures.

#### Method Detection Limits

The Method Detection Limit is the smallest concentration of an analyte of interest that can be measured and reported with 99% confidence that the concentration is greater than zero. The MDLs are determined from the analysis of seven replicate samples in a given matrix containing the analyte at a specified level.

Method Detection Limits (MDLs) are and will be developed in accordance with 40CFR Part 136, Appendix B, Oct. 26, 1984 version of "Definition and Procedure for the Determination of the Method Detection Limits",.

Method detection limits will be determined annually or whenever a new instrument or procedure is brought into the laboratory.

The AAL goal is to have all MDLs less than or equal to the MDLs as given in the analytical methods utilized.

#### Definitions of Concentration Levels

**Low Level** -- Concentrations from the minimum detection limit to a level 5 times the MDL.

**Mid Level** -- The mean level between the minimum detection level and the upper end of the linear range.

**High Level** -- The concentration at the upper end of the linear range.

### Quality Control Charts

Quality control charts will be generated by the QA Officer to ensure accuracy and precision criteria are met for each parameter. The charts will be based on spike, spike duplicate and surrogate recoveries. Each of these parameters will be used as accuracy and precision controls for the analysis applicable. These Quality control charts will be updated bi-annually if enough data is generated.

TABLE 11.1

QUALITY CONTROL CHECK FREQUENCIES

Field Reagent Blanks(*)	1 per 20 or each sample set
Field Replicates(*)	1 per 20 or each sample set
Laboratory Reagent Blanks	1 per sample set
Laboratory Spike Blanks	as needed to determine method effectiveness
Laboratory Duplicates	1 per 20 samples of same matrix or each 30 days
Laboratory Spike Sample	1 per 20 samples of same matrix or each 30 days
Quality Control Sample	1 per 20 samples of same matrix or each 30 days
Performance Evaluation Sample	2 per analyte, semiannually
Continuing Calibration Std.	1 per 20 samples or each sample set (may be substituted for the Quality Control sample)

(\*) These will be determined by the field sampling personnel. The laboratory will analyze these whenever they are received.

If the EPA QC method requirements for a method are more stringent than those listed above, the EPA method requirements will be followed.

TABLE 11.2

QA TARGET METHODS

<u>METHOD</u>	<u>PURPOSE</u>	<u>CONCENTRATION LEVEL</u>	<u>METHOD REFERENCES</u>
Blanks	Detect Interferences	N/A	All methods
Duplicates/Replicates	Precision	Mid Level	All Inorganic Methods
Laboratory Fortified Blanks	Precision & Accuracy	Low Level	Method Detection Limit (MDL) Determination for all methods
		Mid Level	All methods for Accuracy (individual results) and Precision (group results)
Matrix Spikes	Accuracy	Mid Level	All methods
Matrix Spike Duplicates	Accuracy and Precision	Mid Level	All organic methods
Quality Control Samples (QCS) (EPA Performance Evaluation)	Accuracy	Low/Mid/High Levels	All methods
Continuing Calibration Standards	Accuracy	Mid Level	All methods
Surrogate Standards	Accuracy and Precision	Mid Level	All organic methods



## **SECTION 12.0**

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### **DATA REDUCTION, VALIDATION AND REPORTING**

## DATA REDUCTION, VALIDATION AND REPORTING

### Data Reduction

Each analyst is responsible to calculate his/her own data. Bound note books are used in data recording at every step from extraction to final analysis. Chromatogram printouts for organic analyses are evaluated, and the data gathered from them is recorded according to the type of analysis performed. Results are calculated by average response factor with associated computer software or by linear regression calculated manually.

### Data Validation

The Quality Assurance Officer checks all the raw data entries and calculations. The extraction logs, instrument logs and calibration tables for each analyte are checked for completion and method compliance. The Quality Control Charts for surrogate and spike recoveries are reviewed and compared to the generated data. No data from natural samples will be discarded unless sufficient reason may be cited.

### Data Reporting

The analyst's results are entered into a final report spreadsheet by the Report Generation Department. Based on the Quality Assurance Officer's evaluation and approval, the Project Manager reevaluates the data after the final report is prepared.

### Data Storage

All verified raw data sheets for the sample analyses will be stored in AAL's Quality Assurance (QA) files. Copies of sample inventory sheets, shipment invoices, field data sheet, chain of custody forms, and raw data sheets will be kept in a single folder for that particular project. Each project is allotted a new identification number. The project file will be kept for three years after project is completed. All records are stored in the laboratory itself in a controlled access area.

**SECTION 13.0**

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**CORRECTIVE ACTIONS**

## CORRECTIVE ACTION PROCEDURES

### Out-of-Control Situations

The Quality Assurance Manager is charged with the responsibility of maintaining the correctness and validity of all laboratory data generated. An out-of-control situation is indicated by a value outside the control limits. When an out-of-control situation is detected, the Quality Assurance Manager initiates efforts to determine the cause or causes and the corrective actions that will be taken to bring the process under control again. The out-of-control situation and corrective actions taken will be fully documented on a Quality Notice Form. Data obtained since the last in-control quality control sample will be considered invalid. Analysis will not be continued until the process is determined to be under control. Quality control data will be obtained and plotted as soon as the data are available so that appropriate corrective action can be taken as soon as possible to prevent the loss of future data. Timely action may permit the correction of routine data by actions such as reanalyzing the samples before they have been discarded or expired by holding times.

### Troubleshooting Out-of-Control Situations

When an out-of-control situation is detected, a number of steps will be taken to troubleshoot and identify the source of error.

1. Because the monitoring of precision and accuracy is accomplished by analyzing spikes in natural samples, replicates of the spikes that resulted in an out-of-control situation will be analyzed.
2. If the analysis of replicate spikes still indicates an out-of-control situation, corresponding spikes in standard matrices will be prepared and analyzed. The results of this procedure will identify any matrix-related difficulties.
3. If the analysis of spikes in standard matrix indicates that the out-of-control situation still exists, the problem may be associated with contaminated reagents and/or solvents. The analysis of quality control samples will be repeated with new batches of reagents and/or solvents. If these results indicate an in-control situation, the problem will be corrected by using the new batches of reagents and/or solvents.
4. It is possible that all previous steps (1), (2) and (3) will fail to correct the out-of-control situation. In this case, the instrument will be recalibrated and the analysis performed again.

**TABLE 13.1**

**Summary of Corrective Actions Procedures**

Method References	Analysis	Control Item	Acceptance Criteria	Corrective Action
6010B 7000 Series 200 Series	ICP Metals Flame Metals Furnace Metals Al,Sb,As,Ba,Be,Cd Cr,Co,Cu,Fe,Pb,Mg Mn,Ni,K,Se,Ag,Na Tl,Sn,V,Zn	Standard Validation	$\pm 5\%$ of expected value	Purchase new Standard Concentrates
7470A 7471A	Cold Vapor for Hg	Initial Calibration Curve	Not Applicable (N/A)	Rerun Calibration Standards
		Calibration Blank	<MDL	Rerun Blank: Re-prep blank
		Continuing Calibration Standard	$\pm 10\%$	Rerun Standard, if still out of control then recalibrate, rerun samples from last continuing calibration check
		Method Blank	< MDL	Immediately determine the cause of blank problem; redigest set if necessary
		Spiked Samples	Within Control Limits	Reanalyze, if still out of control, determine the cause; redigest set if necessary

**TABLE 13.2**

**Summary of Corrective Actions Procedures**

Method References	Analysis	Control Item	Acceptance Criteria	Corrective Action
EPA 624 EPA 8260B EPA 625 EPA 8270C	GC / MS Volatile Organics Semivolatile Organics	Standard Validation	$\pm 10\%$ of actual value	Purchase new Standard Concentrates
		Initial Calibration Curve	The %RSD for each individual calibration check compound (CCC) must be $<30\%$ , other analytes $<15\%$	Rerun Calibration Standards
		Calibration Blank	$<MDL$	Rerun Blank:
		Continuing Calibration Standard	The % difference for each CCC should be $<20\%$ for the initial calibration to be valid	Rerun Standard, if still out of control then recalibrate. Rerun samples from last continuing calibration check
		Instrument Blank  Method Blank	Response $< MDL$  Response $< MDL$	Immediately determine the cause of blank problem. Reextract / rerun set if necessary
		Spiked Samples	Within Control Limits	Reanalyze, if still out of control, determine cause of the problem. Reextract/rerun set if necessary

TABLE 13.3

Summary of Corrective Actions Procedures

Method References	Analysis	Control Item	Acceptance Criteria	Corrective Action
EPA 608 EPA 8081A EPA 8082 EPA 8151	GC/Dual ECD Pesticides PCBs Herbicides	Standard Validation	$\pm 10\%$ of actual value	Purchase new Standard Concentrates
		Initial Calibration Curve	Correlation coefficient of variation must be $>0.995$ or $< 20\%$ RSD.	Rerun Calibration Standards. If still unacceptable, then remake standards
		Initial Calibration Blank	Response $< \text{MDL}$	Rerun Blank
		Continuing Calibration Standard	$\pm 15\%$ of expected value	Reanalyze standard, if still unacceptable, then remake standards. If still unacceptable, then recalibrate and rerun samples from last continuing calibration standard check
		QC Check Standard	$\pm 15\%$ of expected value	Reanalyze standard, if still unacceptable, then remake standards. If still unacceptable, immediately determine cause for problem - recalibrate if necessary.
		Method Blank	Response $< \text{MDL}$	Immediately determine the cause of blank problem.
		Instrument Blank	Response $< \text{MDL}$	Reextract / rerun set if necessary
		Spiked Samples	Within Control Limits	Reanalyze, if still out of control, determine cause of the problem. Reextract/rerun set if necessary

**SECTION 14.0**

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**PERFORMANCE AND SAFETY AUDITS**



## LABORATORY, PERFORMANCE & SAFETY AUDITS

### Laboratory Audits

At present Accura Analytical Laboratory Inc., does not perform field operations, and is a Chemical / Analytical Laboratory. The audit methods are restricted to laboratory procedures only.

The QA Manager or Laboratory Manager performs internal audits on a regular basis and QA matters are discussed in weekly meetings. Accura Analytical Laboratory is actively involved in EPA performance evaluation programs. Performance evaluation reports are kept on file, and are available for external audits.

### Performance Audits

Performance audits are conducted on a regular basis and may consist of one or more of the following:

1. Blind Samples - The QA Manager prepares blind samples as needed and submits them to the laboratory as regular samples for analysis. These sample allow the accuracy of an analyst's technique to be determined without alerting them to the nature of the sample.
2. Quality Control Samples - Quality control samples are purchased from Environmental Resource Associates on an "as needed" basis. The results are not available to the analysts until all the required analyses are complete. Once the results have been evaluated, a written report is submitted to the Laboratory Manager. This report includes suggested corrective actions to address any outliers.
3. EPA Performance Evaluation Samples (WP and WS programs) - Accura Analytical Laboratory Inc. participates in the EPA WP and WS programs. The results of these studies are kept on file and are available for review. Corrective actions taken to address outliers are documented and kept on file.

### Safety Inspections

The Safety Officer conducts Safety Inspections on a weekly basis. Form 14.1 gives an abbreviated list of the concerns checked during each inspection. A copy of the report is submitted to the Laboratory Manager and all applicable personnel for corrective actions. \_

Form 14.1

SAFETY AUDITS

Date:

Name:

A. SHIPPING/RECEIVING	
1. Fire Equipment	
2. Analyst using appropriate safety equip.	
3. Flammable Chemicals	
4. Sample Storage	
5. Fire Exits Clear	
6. Exit Signs Illuminated	
7. Chemical Storage	
B. LABORATORY	
1. Flammable Chemicals	
2. Cleanliness	
3. No food or drink	
4. Analyst using appropriate safety equip	
5. Gases Secured	
6. Fire Exits Clear	
7. Chemicals Storage	
COMMENTS: _____	
_____	
_____	
_____	
_____	

SECTION 15.0

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QUALITY ASSURANCE REPORTS

## QUALITY ASSURANCE REPORTS

Quality assurance reports are prepared on a quarterly basis. These reports are meant for internal use only. These reports include summarized results of any quality control or performance evaluation studies and overall system performance. Also included are any suggested changes in laboratory procedures and a schedule of QA/QC activities to be carried out during the upcoming quarter.

The quality control reports are prepared by the QA/QC officer. A copy of this report is submitted to the laboratory manager.

**APPENDIX**  
**SELECTED REFERENCES**

1. APHA (American Public Health Association). 1989. Standard Methods for the Examination of Water and Wastewater, 17th edition. American Public Health Association, Washington, D.C.
2. "Definition and Procedure for the Determination of the Method Detection Limit", 40CFR Part 136, Appendix B, Oct. 26, 1984.
3. "Manual for Certification of Laboratories Analyzing Drinking Water," EPA 570/9-90/008, April 1990.
4. Methods for Chemical Analysis of Water and Wastes, EPA 600 / 4-79-020, revised March 1983.
5. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, EPA-600 / 4-82-057, July 1982.
6. "Methods for Organochlorine Pesticides in Industrial Effluents," 1973, U.S. EPA, Environmental Research Center, Analytical Quality Control Laboratory, Cincinnati, OH 45268.
7. "Method for Polychlorinated Biphenyls (PCBs) in Industrial Effluents," 1973, U.S. EPA, Environmental Research Center, Analytical Quality Control laboratory, Cincinnati, OH 45268.
8. Methods for the Determination of Organic Compounds in Drinking Water, EPA 600 / 4-88-039, December 1988.
9. "Test Methods for Evaluating Solid Waste, Physical / Chemical Methods", Third Edition.(EPA SW-846), 1986 as amended by Final Update III, December 1996.
10. U.S. EPA (United States Environmental Protection Agency), 1979. Handbook for Analytical Quality Control in Water and Wastewater Laboratories. EPA-600 / 4-79-019 Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, Cincinnati, OH.

## APPENDIX A

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### REFERENCES